

JUDGE BAYOFF

UNITED STATES DISTRICT COURT  
SOUTHERN DISTRICT OF NEW YORK

15 CV 01668

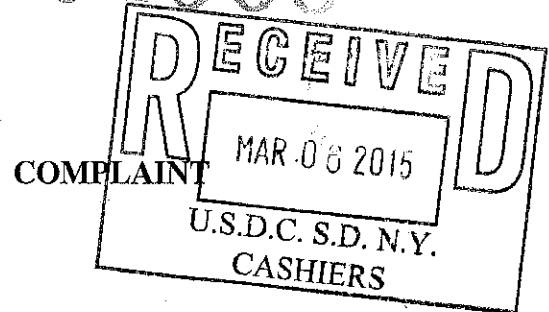
SULZER MIXPAC AG,

Plaintiff,

-against-

MEDENSTAR INDUSTRIES CO.,  
LTD.

Defendant.



TRIAL BY JURY DEMAND

Plaintiff Sulzer Mixpac AG ("Mixpac" or "Plaintiff") submits this complaint against defendant Medenstar Industries Co., Ltd. ("Defendant") seeking damages, injunctive and other relief for trademark counterfeiting, patent infringement and related claims, and alleges as follows:

**PARTIES**

1. Plaintiff Sulzer Mixpac AG is a Swiss corporation with its principal place of business at Ruetistrasse 7, CH-9469 Haag, Switzerland.
2. Defendant Medenstar Industries Co., Ltd. is a Chinese company located at Rm. 8H, Bldg. E, No. 50, Lane 2080, Lianhua Rd., Shanghai 201103, China.

**JURISDICTION AND VENUE**

3. This court has jurisdiction over Mixpac's patent infringement claims under 28 U.S.C. §§ 1331, 1338(a). This court has jurisdiction over Mixpac's trademark counterfeiting and trademark infringement claims under 28 U.S.C. §§ 1331, 1338(a) and 15 U.S.C. § 1121.

4. This court has personal jurisdiction over Defendant because it has transacted and is transacting business in this district and have sold, offered for sale, distributed, or advertised products that infringe Mixpac's registered trademarks in this judicial district. Defendant also has made, used, imported, sold, or offered for sale in the United States, including within this judicial district, a product which infringes or has infringed Mixpac's United States Patent No. 5,609,271 ("the '271 Patent"), United States Patent No. 5,918,772 ("the '772 Patent"), and United States Patent No. 6,186,363 ("the '363 Patent"), and Mixpac's trademarks, specifically U.S. Trademark Registration No. 3,762,232 (yellow), Reg. No. 3,762,233 (teal/green), Reg. No. 3,976,379 (blue), Reg. No. 3,976,380 (pink), Reg. No. 3,976,381 (purple), Reg. No. 3,976,382 (brown), and Reg. No. 4,051,261 (no color) and Defendant's products can be found in this district. Defendant has substantial and continuous contacts with New York and has committed acts of infringement in New York, including the Southern District of New York, sufficient to confer personal jurisdiction upon it. In addition, Defendant is an alien corporation and is subject to personal jurisdiction in any judicial district under 28 U.S.C. §§1391(d).

5. Venue properly lies in this court under 28 U.S.C. §§ 1391(b) and (c) and 1400(b) because Defendant is subject to personal jurisdiction and has committed acts of trademark infringement and patent infringement in this district. Defendant's offering or selling its products in New York gives rise to proper venue as a substantial part of their infringing acts have occurred in this district.

## **BACKGROUND**

### ***The MIXPAC Three-Part Mixing System***

6. Mixpac is the exclusive manufacturer in Switzerland of a patented three-part system for mixing two-part adhesives for dental applications. The system consists of 1) a

dispenser-like caulking gun, 2) a cartridge containing a two-part chemical such as an epoxy having a catalyst and a resin, and 3) a mixing tip that mixes the chemicals before they are applied for making, for example, an impression or mold for teeth.

***The Registered Mixing Tips' Colored Dome and Dome Mark***

7. Mixpac has since at least as early as 1997 used a distinctive dome shape and color design Mark for its mixing tips (hereinafter “Colored Dome Mark”).

8. The Colored Dome Mark has been used to identify Mixpac’s dental mixing system and tips.

9. Mixpac’s Colored Dome Mark includes the line of mixing tips with six pleasing “candy-like” colors of yellow, teal, blue, pink, purple, and brown (“Candy Colors”). The Colored Dome Mark also includes the Dome shape apart from the color (“Dome Mark”).

10. The Colored Dome Mark, Dome Mark, and Candy Colors are non-functional. They are not essential to the product’s purpose, and they are not dictated by concern for cost efficiency. This is evidenced by other companies in the industry that use different designs and colors, or no colors, for their dental products, none of which include the Candy Colors, or the design features of the Colored Dome Mark.

11. The Colored Dome Mark is distinctive and identifies a single source. Additionally, over more than fifteen years the Colored Dome Mark has acquired secondary meaning as the relevant public has come to associate the Colored Dome Mark with a single source—Mixpac. Mixpac informs the dental public to “look for” the Colored Dome Mark and informs that the Dome and Candy Colors are trademarks. Purchasers choose mixing tips based on the Colored Dome Mark, Dome Mark, and Candy Colors.

***The Colored Dome and Dome Mark U.S. Trademark Registrations***

12. Mixpac was awarded seven U.S. Trademark Registrations for the look of the mixing tips: U.S. Trademark Registration No. 3,762,232 (yellow), Reg. No. 3,762,233 (teal/green), Reg. No. 3,976,379 (blue), Reg. No. 3,976,380 (pink), Reg. No. 3,976,381 (purple), Reg. No. 3,976,382 (brown) (“the Colored Dome Trademark Registrations”), and Reg. No. 4,051,261 (shape only - no color) (the “Dome Trademark Registration”). Copies of the registration certificates are attached as **Exhibit A**. The Colored Dome Trademark Registrations and the Dome Trademark Registration are prima facie evidence of the validity of the marks and registration of the marks, and Mixpac’s exclusive right to use the marks in connection with mixing tips.

***Defendant’s Counterfeit Mixing Tips***

13. Defendant seeks to capitalize on the success of the Mixpac mixing tips by copying the distinctive Colored Dome Mark, Candy Colors and the Dome Mark to intentionally confuse purchasers into believing the counterfeit products are manufactured or licensed by Mixpac (“Counterfeit Mixing Tips”). Attached as **Exhibit B** is an image of Defendant’s Counterfeit Mixing Tips. U.S. Customs and Border Protection has previously seized Defendant’s Counterfeit Mixing Tips as they simulate the Colored Dome Trademark Registrations, but Defendant nevertheless continues to sell infringing mixing tips.

14. Defendant’s mixing tips are counterfeit as they are spurious and are identical with or substantially indistinguishable from Mixpac’s Colored Dome Mark and Dome Mark as shown in the Colored Dome Trademark Registrations and the Dome Trademark Registration.

15. Defendant’s copied mixing tips are of lesser quality and safety and reliability, and threaten Mixpac’s reputation in its product, to the detriment of Mixpac and the public.

16. Defendant offers Counterfeit Mixing Tips for sale on its website [www.medenstar.com](http://www.medenstar.com). (**Exhibit B**)

17. Offering of Counterfeit Mixing Tips is intended to and will confuse the dental trade as to a false connection between Mixpac and Defendant.

### ***Mixing Tips Patents***

18. Mixpac owns U.S. Patents for mixing tips and has all rights to assert the patents.

19. On March 11, 1997, the ‘271 Patent was duly and legally issued for an invention entitled “*Mixer and Multiple Component Dispensing Device Assembly and Method for the Aligned Connection of the Mixer to the Multiple Component Dispensing Device.*” The ‘271 Patent is assigned to Sulzer Mixpac AG. A copy of the ‘271 Patent is attached as **Exhibit C**.

20. On July 6, 1999, the ‘772 Patent was duly and legally issued for an invention entitled “*Bayonet Fastening Device for the Attachment of an Accessory to a Multiple Component Cartridge or Dispensing Device.*” The ‘772 Patent is assigned to Sulzer Mixpac AG. A copy of the ‘772 patent is attached as **Exhibit D**.

21. On February 13, 2001, the ‘363 Patent was duly and legally issued for an invention entitled “*Bayonet Fastening Device For The Attachment Of An Accessory To A Multiple Component Cartridge Or Dispensing Device*”. The ‘363 Patent is assigned to Sulzer Mixpac AG. A copy of the ‘363 Patent is attached as **Exhibit E**.

22. Defendant has offered for sale or delivered into this judicial district mixing tips that infringe or infringed the Colored Dome Mark, the Candy Colors, the Dome Mark and the ‘271, ‘772, and ‘363 Patents.

***This Court Has Entered Several Restraining Orders, Consent or Default Judgments, and Injunctions Which Confirm the Validity and Infringement of the Colored Dome Mark, the Dome Mark, the Candy Colors, and the ‘772 and ‘363 and ‘271 Patents***

23. In *Sulzer Mixpac v. TPC Advanced Technologies, Inc.*, 08 Civ. 10364 (DC), this Court entered a Temporary Restraining Order against further infringement of the Colored Dome Mark on December 1, 2008, and the Court later entered six consent or default judgments which confirm the validity and infringement of the Colored Dome Mark and the ‘772 and ‘363 Patents. On November 30, 2009 in *Sulzer Mixpac v. Ritter GmbH, NSJ and Peng Waves*, 09 Civ. 9705 (DAB) the Court issued a TRO, followed by the issuance of a Preliminary Injunction on December 14, 2009, and later a default judgment confirming the validity and infringement of Mixpac’s Colored Dome Mark and the ‘772 and ‘363 Patents. In *Sulzer Mixpac USA v. Purelife Gloves, LLC*, 09 Civ. 10430 (DAB) and *Sulzer Mixpac USA v. Crown Dentsply et al.*, 10 Civ. 8911 (DAB), the Court entered consent judgments further confirming the validity and infringement of the Colored Dome Mark and the ‘772 and ‘363 Patents on May 10, 2011 and April 21, 2011, respectively. On April 11, 2012 in *Sulzer Mixpac v. Seil Global Co. Ltd.*, 11 Civ. 4783 (DAB), this Court entered a Default Judgment and Permanent Injunction confirming certain redesigned mixing tips infringe the ‘271 Patent. Further, in *Sulzer Mixpac USA v. Rainbow Specialty & Health Products (USA) et al.*, 12 Civ. 6970 (RJS), *Sulzer Mixpac USA v. UC Dental Products, Inc. dba Happystone Dental Supply* 12 Civ. 7863 (LTS), and *Sulzer Mixpac USA v. Spident USA, Inc. and Spident Co., Ltd et al.*, 12 Civ. 8563 (PAC), the court entered consent judgments confirming the validity and infringement of the Colored Dome Mark and the ‘772, ‘363, and ‘271 Patents on November 21, 2012, November 27, 2012, and January 23, 2013, respectively.

## **COUNT I**

### **TRADEMARK COUNTERFEITING UNDER 15 U.S.C. § 1114**

24. Mixpac realleges and incorporates herein by reference the allegations in paragraphs 1 through 23 of its complaint.

25. Defendant has advertised, offered for sale, distributed, or sold mixing tips which are spurious and which are identical with or are substantially indistinguishable from Mixpac's yellow, or teal/green, or blue, or pink mixing tips as shown in the Colored Dome Trademark Registrations, Reg. No. 3,762,232 (yellow), Reg. No. 3,762,233 (teal/green), Reg. No. 3,976,379 (blue), Reg. No. 3,976,380 (pink), Reg. No. 3,976,381 (purple), Reg. No. 3,976,382 (brown), or the Dome Mark Registration, Reg. No. 4,051,261 (no color).

26. Defendant's conduct is likely to cause confusion, to cause mistake, and to deceive as to Defendant's affiliation, connection, association, or sponsorship with Mixpac.

27. Defendant's infringement is willful and with notice of Mixpac's trademark registrations.

28. Mixpac has no adequate remedy at law. Defendant's conduct has caused and, if not enjoined, will continue to cause irreparable damage to Mixpac. As a result of Defendant's wrongful conduct, Mixpac is entitled to injunctive relief, Defendant's profits, statutory damages, damages, and attorney's fees and costs.

## **COUNT II**

### **INFRINGEMENT OF THE REGISTERED COLORED DOME AND DOME TRADEMARKS BY DEFENDANT UNDER 15 U.S.C. §§ 1125(a) and 1114**

29. Mixpac realleges and incorporates herein by reference the allegations in paragraphs 1 through 28 of its complaint.

30. Defendant adopted its trade dress for its mixing tips with knowledge of the Colored Dome Mark and Dome Marks.

31. Defendant has misleadingly used, and continue to use, a confusingly similar trade dress to the Colored Dome Mark and Dome Mark as shown in the Colored Dome Trademark Registrations and Dome Mark Registration, which is likely to cause confusion, to cause mistake, and to deceive as to Defendant's affiliation, connection, association, or sponsorship with Mixpac.

32. Defendant's acts are calculated to deceive, or are likely to deceive, the public, which recognizes and associates the Colored Dome Mark and the Dome Mark with Mixpac. Moreover, Defendant's conduct is likely to cause confusion, to cause mistake, or to deceive the public as to the source of Defendant's products, or as to a possible affiliation, connection with or sponsorship by Mixpac.

33. Defendant's conduct has caused Mixpac to suffer and, unless enjoined by the court, will cause Mixpac to continue to suffer damage to its operation, reputation, and goodwill and will suffer the loss of sales and profits that Mixpac would have made but for Defendant's acts. Defendant has been, and will continue to be, unjustly enriched by its unlawful acts.

34. Defendant's infringement is willful and with notice of Mixpac's trademark registrations.

35. Mixpac has no adequate remedy at law. Defendant's conduct has caused and, if not enjoined, will continue to cause irreparable damage to Mixpac. As a result of Defendant's wrongful conduct, Mixpac is entitled to injunctive relief, Defendant's profits, damages, and attorney's fees and costs.



### COUNT III

#### **FALSE DESIGNATION OF ORIGIN UNDER 15 U.S.C. § 1125(a)**

36. Mixpac realleges and incorporates herein by reference the allegations in paragraphs 1 through 35 of its complaint.

37. Defendant's mixing tips use the Colored Dome Mark, Candy Colors, and Dome Mark in such a way as to unfairly compete in the marketplace by drawing a false association between Defendant's products and Mixpac including offering Counterfeit Mixing Tips on its website [www.medenstar.com](http://www.medenstar.com). **(Exhibit B)**

38. Defendant has made false designations of origin and false or misleading descriptions or representations of fact in commercial advertising or promotion which misrepresent the nature, characteristics, qualities, sponsorship, or association with another person's goods, services, or commercial activities in violation of 15 U.S.C. § 1125(a).

39. Defendant has violated and, upon information and belief, intends to continue to willfully, knowingly, and intentionally violate 15 U.S.C. § 1125(a) by its unlawful acts in a manner that is likely to cause confusion, mistake or deceive as to the nature, characteristics, or qualities of its goods, services, or commercial activities.

40. Defendant's conduct has caused Mixpac to suffer irreparable harm and, unless enjoined by the Court, will cause Mixpac to continue to suffer damage to its operation, reputation, and goodwill, and will suffer the loss of sales and profits that Mixpac would have made but for Defendant's acts. Defendant has been, and will continue to be, unjustly enriched by their unlawful acts.

41. Defendant has willfully made false designations of origin with knowledge and with notice of Mixpac's trademark rights.

42. Mixpac has no adequate remedy at law. Defendant's conduct has caused and, if not enjoined, will continue to cause irreparable damage to Mixpac. As a result of Defendant's wrongful conduct, Mixpac is entitled to injunctive relief, Defendant's profits, damages, and attorney's fees and costs.

#### **COUNT IV**

##### **VIOLATION OF N.Y. GEN. BUS. LAW § 349**

43. Mixpac realleges and incorporates herein by reference the allegations in paragraphs 1 through 42 of its complaint.

44. Defendant's acts, including the unauthorized manufacture and distribution of its mixing tips, constitute a violation of General Business Law § 349 because they are likely to cause confusion or mistake, or deceive consumers into thinking that Defendant's and Mixpac's products emanate from the same source. The public has an interest in being able to correctly identify the source of the Mixpac products.

45. Defendant's conduct has caused harm to the public because its products compromise the health or safety of consumers of dental products or services.

46. Defendant willfully engaged in one or more deceptive trade practices.

47. Mixpac has no adequate remedy at law. Defendant's conduct has caused and, if not enjoined, will continue to endanger consumers of dental products or services and cause irreparable damage to Mixpac. As a result of Defendant's wrongful conduct, Mixpac is entitled to injunctive relief, Defendant's profits, damages, and attorney's fees and costs.

#### **COUNT V**

##### **VIOLATION OF N.Y. GEN. BUS. LAW § 350**

48. Mixpac realleges and incorporates herein by reference the allegations in paragraphs 1 through 47 of its complaint.

49. Defendant's acts violate General Business Law § 350 because, by offering copies of Mixpac's products, they falsely represent to consumers and professionals that their products are somehow associated or affiliated with, sponsored, or endorsed by Mixpac.

50. Defendant's acts and misrepresentations are likely to cause confusion, mistake, or deception as to the source of their products and services.

51. Should such misrepresentations continue, it will produce an irreparable injury to Mixpac because it allows Defendant to trade off Mixpac's goodwill and unfairly and improperly market their goods through misleading statements.

52. Defendant's conduct has caused harm to the public because their products compromise the health or safety of consumers of dental services.

53. Defendant has willfully made false representations with knowledge and with notice of Mixpac's trademark rights.

54. Defendant's acts have caused, and continue to cause, irreparable harm to Mixpac. Unless this court enjoins Defendant from continuing its unauthorized acts, Mixpac will continue to suffer irreparable harm. As a result of Defendant's wrongful conduct, Mixpac is entitled to injunctive relief, Defendant's profits, damages, and attorney's fees and costs.

## **COUNT VI**

### **VIOLATION OF N.Y. GEN. BUS. LAW § 360-1**

55. Mixpac realleges and incorporates herein by reference the allegations in paragraphs 1 through 54 of its complaint.

56. Defendant's conduct is likely to cause injury to Mixpac's reputation and dilute the distinctive quality of its trademarks.

57. Mixpac's Colored Dome Mark is highly distinctive and has become well known and widely respected in the dental industry.

58. Mixpac's products are safe and meet Mixpac's standards for quality and cleanliness.

59. Mixpac's mixing tips have been properly tested to fit and work effectively with Mixpac's complementary dispensing systems.

60. Defendant's products may not be safe and do not meet Mixpac's standards for quality and cleanliness.

61. Defendant's use of Mixpac's Colored Dome Mark on its identical (in appearance), yet substandard, products is likely to cause consumers to believe that Defendant's products emanate from the same source as Mixpac's.

62. Defendant's unlawful manufacture and distribution of products bearing Mixpac's distinctive trademarks are likely to tarnish Mixpac's image and blur the distinctive quality of its marks.

63. Defendant's actions threaten to undermine and damage the goodwill and reputation associated with Mixpac's trademark in the eyes of the dental trade industry and general consuming public.

64. Defendant has willfully made false statements with knowledge and with notice of Mixpac's trademark rights.

65. Defendant's acts have caused, and continue to cause, irreparable harm to Mixpac. Unless this Court enjoins Defendant from continuing its unauthorized acts, Mixpac

will continue to suffer irreparable harm. As a result of Defendant's wrongful conduct, Mixpac is entitled to injunctive relief, Defendant's profits, damages, and attorney's fees and costs.

## **COUNT VII**

### **COMMON LAW TRADEMARK INFRINGEMENT**

66. Mixpac realleges and incorporates herein by reference the allegations in paragraphs 1 through 65 of its complaint.

67. Defendant adopted the look of its mixing tips with knowledge of the Colored Dome Mark, Candy Colors, and the Dome Mark.

68. Defendant has misleadingly used, and continues to use, a confusingly similar trade dress to the Colored Dome Mark, Candy Colors, and the Dome Mark that is likely to cause confusion, to cause mistake, and to deceive as to Defendant's affiliation, connection, association, or sponsorship with Mixpac.

69. Defendant's acts are calculated to deceive, or are likely to deceive, the public, which recognizes and associates the Colored Dome Mark, Candy Colors, and the Dome Mark with Mixpac. Moreover, Defendant's conduct is likely to cause confusion, to cause mistake, or to deceive the public as to the source of Defendant's products, or as to a possible affiliation, connection with, or sponsorship by Mixpac.

70. Defendant has willfully infringed with knowledge and with notice of Mixpac's trademark rights.

71. Defendant's acts have caused, and continue to cause, irreparable harm to Mixpac. Unless this court enjoins Defendant from continuing its unauthorized acts, Mixpac will continue to suffer irreparable harm. As a result of Defendant's wrongful conduct, Mixpac is entitled to injunctive relief, Defendant's profits, damages, and attorney's fees and costs.

## **COUNT VIII**

### **COMMON LAW UNFAIR COMPETITION**

72. Mixpac realleges and incorporates by reference the allegations in paragraphs 1 through 71 of its complaint.

73. Defendant's acts and uses constitute unfair competition under common law.

74. Defendant adopted its trade dress in bad faith as they knowingly, willfully, and intentionally copied the shape and colors of Mixpac's product to trade off Mixpac's labor, expenditures, and good will.

75. Defendant's mixing tips utilize the Colored Dome Mark, Candy Colors, and the Dome Mark in such a way as to unfairly compete in the marketplace by drawing a false association between Defendant's products and Mixpac.

76. Defendant has made false designations of origin and false or misleading descriptions or representations of fact in commercial advertising or promotion which misrepresent the nature, characteristics, or qualities of another person's goods, services, or commercial activities.

77. Defendant's conduct has caused Mixpac to suffer irreparable harm and, unless enjoined by the court, will cause Mixpac to continue to suffer damage to its operation, reputation, and goodwill and will suffer the loss of sales and profits that Mixpac would have made but for Defendant's acts. Defendant has been, and will continue to be, unjustly enriched by their unlawful acts.

78. Mixpac has no adequate remedy at law. Defendant's conduct has caused and, if not enjoined, will continue to cause irreparable damage to Mixpac. As a result of Defendant's

wrongful conduct, Mixpac is entitled to injunctive relief, Defendant's profits, damages, and attorney's fees and costs.

**COUNT IX**

**PATENT INFRINGEMENT OF U.S. PATENT NO. 5,609,271  
UNDER 35 U.S.C. § 281**

79. Mixpac realleges and incorporates herein by reference the allegations in paragraphs 1 through 78 of its complaint.

80. By using, importing, selling, or offering to sell infringing mixing tips, Defendant has infringed one or more claims of the '271 Patent directly, contributorily, or through inducement. Defendant has engaged in the foregoing conduct with respect to the patented invention in the United States without authority from Mixpac during the term of the '271 Patent.

81. Defendant did not stop using, selling, and/or offering for sale the products at issue to avoid infringing the '271 Patent during the term of the '271 Patent.

82. Defendant's conduct has caused Mixpac to suffer damage to their operation, reputation, and goodwill.

83. Mixpac has no adequate remedy at law. Defendant's conduct has caused and, if not enjoined, will continue to cause irreparable damage to Mixpac. As a result of Defendant's wrongful conduct, Mixpac is entitled to Defendant's profits, damages, and attorney's fees and costs.

**COUNT X**

**PATENT INFRINGEMENT OF U.S. PATENT NO. 5,918,772  
UNDER 35 U.S.C. § 281**

84. Plaintiff realleges and incorporates herein by reference the allegations in paragraphs 1 through 83 of its complaint.

85. By using, importing, selling, or offering to sell infringing mixing tips, Defendant has infringed one or more claims of the ‘772 Patent directly, contributorily, or through inducement. Defendant has engaged in the foregoing conduct with respect to the patented invention in the United States without authority from Mixpac during the term of the ‘772 Patent.

86. Defendant will not stop using, selling, and/or offering for sale the products at issue to avoid infringing the ‘772 Patent.

87. Defendant’s infringement has been deliberate, willful, and wanton, and with full knowledge of the ‘772 Patent.

88. Defendant’s conduct has caused Mixpac to suffer and, unless enjoined by the court, will cause Mixpac to continue to suffer damage to their operation, reputation, and goodwill.

89. Mixpac has no adequate remedy at law. Defendant’s conduct has caused and, if not enjoined, will continue to cause irreparable damage to Mixpac. As a result of Defendant’s wrongful conduct, Mixpac is entitled to a temporary restraining order, injunctive relief, and damages.



**COUNT XI**

**PATENT INFRINGEMENT OF U.S. PATENT NO. 6,186,363  
UNDER 35 U.S.C. § 281**

90. Mixpac realleges and incorporates by reference the allegations in paragraphs 1 through 89 of its complaint.

91. By using, selling, or offering to sell infringing mixing tips incorporating Mixpac's design features, Defendant has infringed one or more claims of the '363 Patent directly, contributorily, or through inducement. Defendant has engaged in the foregoing conduct with respect to the patented invention in the United States without authority from Mixpac and during the term of the '363 Patent.

92. Defendant will not stop using, selling, or offering for sale the products at issue to avoid infringing the '363 Patent.

93. Defendant's infringement has been deliberate, willful, and wanton, and with full knowledge of the '363 Patent.

94. Defendant's conduct has caused Mixpac to suffer and, unless enjoined by the court, will cause Mixpac to continue to suffer damage to its operation, reputation, and goodwill.

95. Mixpac has no adequate remedy at law. Defendant's conduct has caused and, if not enjoined, will continue to cause irreparable damage to Mixpac. As a result of Defendant's wrongful conduct, Mixpac is entitled to a temporary restraining order, injunctive relief, and damages.

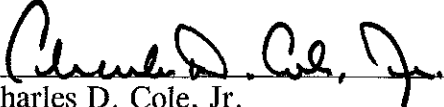
### **RELIEF REQUESTED**

Wherefore, Mixpac requests that the court enter a judgment in Mixpac's favor and against Defendant and provide Mixpac the following relief:

- A. Order, adjudge, and decree that Defendant has infringed the Mixpac Colored Dome Mark and Dome Mark under 15 U.S.C. §§ 1114, 1125(a);
- B. Order, adjudge, and decree that Defendant has committed trademark counterfeiting of U.S. Trademark Reg. No. 3,762,232 (yellow), Reg. No. 3,762,233 (teal/green), Reg. No. 3,976,379 (blue), Reg. No. 3,976,380 (pink), Reg. No. 3,976,381 (purple), Reg. No. 3,976,382 (brown), and Reg. No. 4,051,261 (no color) under 15 U.S.C. § 1114.
- C. Order, adjudge, and decree that Defendant willfully and knowingly infringed the Mixpac Colored Dome Mark, Candy Colors, and Dome Mark;
- D. Issue a preliminary and permanent injunctive relief prohibiting Defendant and its respective parents, subsidiaries, principals, officers, agents, affiliates, servants, attorneys, employees, and all others in privity with it from using any trade dress which is likely to be confused with the Colored Dome Mark, Candy Colors, and Dome Mark;
- E. Order Defendant to identify and recall from customers and destroy all infringing materials, including but not limited to all packaging and advertising incorporating the infringing trade dress or any other trade dress confusingly similar to the Colored Dome Mark, Candy Colors, and Dome Mark;
- F. Award Mixpac damages for trademark infringement including prejudgment interest and costs against Defendant under 15 U.S.C. § 1117;

- G. Award Mixpac three times its damages to compensate Mixpac under 15 U.S.C. § 1117;
- H. Award Mixpac its reasonable attorney's fees under 15 U.S.C. § 1117;
- I. Award Mixpac statutory damages for trademark counterfeiting pursuant to 15 U.S.C. § 1117;
- J. Order, adjudge, and decree that Defendant has infringed the '271, '772, and '363 Patents under 35 U.S.C. § 281;
- K. Order, adjudge, and decree that Defendant willfully and knowingly infringed the '271, '772, and '363 Patents;
- L. Order, adjudge, and decree that Defendant's infringement of the '271, '772, and '363 Patents is exceptional under 35 U.S.C. § 285;
- M. Award Mixpac damages for patent infringement including prejudgment interest and costs against Defendant under 35 U.S.C. § 284;
- N. Award Mixpac three times its damages to compensate Plaintiff under 35 U.S.C. § 284;
- O. Award Mixpac its reasonable attorney's fees under 35 U.S.C. § 285; and
- P. Award such other and further relief as the court may deem just.

Dated: New York, New York  
March 6, 2015

  
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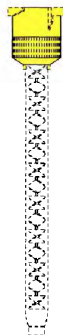
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Attorneys for Sulzer Mixpac AG

## EXHIBIT A

# United States of America

## United States Patent and Trademark Office



**Reg. No. 3,762,232** SULZER MIXPAC AG (SWITZERLAND CORPORATION)  
Registered Mar. 23, 2010 GRUNDSTRASSE 12  
ROTKREUZ, SWITZERLAND CH-6343

**Int. Cls.: 7, 8 and 10** FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR USE  
IN CONNECTION WITH POWER-OPERATED AND MACHINE-OPERATED DISPENSING  
GUNS USED FOR MIXING ADHESIVES AND SEALANTS FOR USE IN THE CONSTRUCTION,  
AUTOMOTIVE, ELECTRONICS, AEROSPACE, AND INDUSTRIAL ASSEMBLY AND  
REPAIR INDUSTRIES, IN CLASS 7 (U.S. CLS. 13, 19, 21, 23, 31, 34 AND 35).

**TRADEMARK  
PRINCIPAL REGISTER**

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.

FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR USE  
IN CONNECTION WITH MANUALLY-OPERATED DISPENSING GUNS USED FOR MIXING  
ADHESIVES AND SEALANTS FOR USE IN THE CONSTRUCTION, AUTOMOTIVE,  
ELECTRONICS, AEROSPACE, AND INDUSTRIAL ASSEMBLY AND REPAIR INDUSTRIES,  
IN CLASS 8 (U.S. CLS. 23, 28 AND 44).

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.

FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR  
DENTAL APPLICATIONS, IN CLASS 10 (U.S. CLS. 26, 39 AND 44).

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.



*David J. Kybas*

Director of the United States Patent and Trademark Office

THE MARK CONSISTS OF THE COLOR YELLOW AND THE CONFIGURATION OF A FUTURISTIC, DOME-FAÇADE TIP HAVING A SMOOTH BOTTOM PORTION, A SLIGHTLY INDENTED MIDDLE PORTION, AN UPPER PORTION ANGLED INWARDLY WHICH NARROWS AND RESTRICTS TO A TOP PORTION THAT ATTACHES TO A TRANSPARENT STEM WHICH ENCASES A CORKSCREW LIKE ELEMENT. THE DOTTED OUTLINE OF THE BOTTOM TAB AND TOP TABS ON THE DOME-FAÇADE TIP, THE SLIGHTLY INDENTED MIDDLE PORTION CONSISTING OF UNIFORM CONTINUOUS RIDGES, THE STEM AND THE CORKSCREW LIKE ELEMENT IS INTENDED TO SHOW POSITION OF THE MARK ON THE GOODS AND IS NOT PART OF THE MARK.

THE COLOR(S) YELLOW IS/ARE CLAIMED AS A FEATURE OF THE MARK.

**Reg. No. 3,762,232** SEC. 2(F).

SER. NO. 77-623,873, FILED 12-1-2008.

NORA BUCHANAN WILL, EXAMINING ATTORNEY

# United States of America

## United States Patent and Trademark Office



**Reg. No. 3,762,233** SULZER MIXPAC AG (SWITZERLAND CORPORATION)  
Registered Mar. 23, 2010 GRUNDSTRASSE 12  
ROTKREUZ, SWITZERLAND CH-6343

**Int. Cls.: 7, 8 and 10** FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR USE  
IN CONNECTION WITH POWER-OPERATED AND MACHINE-OPERATED DISPENSING  
GUNS USED FOR MIXING ADHESIVES AND SEALANTS FOR USE IN THE CONSTRUCTION,  
AUTOMOTIVE, ELECTRONICS, AEROSPACE, AND INDUSTRIAL ASSEMBLY AND  
REPAIR INDUSTRIES, IN CLASS 7 (U.S. CLS. 13, 19, 21, 23, 31, 34 AND 35).

**TRADEMARK  
PRINCIPAL REGISTER**

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.

FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR USE  
IN CONNECTION WITH MANUALLY-OPERATED DISPENSING GUNS USED FOR MIXING  
ADHESIVES AND SEALANTS FOR USE IN THE CONSTRUCTION, AUTOMOTIVE,  
ELECTRONICS, AEROSPACE, AND INDUSTRIAL ASSEMBLY AND REPAIR INDUSTRIES,  
IN CLASS 8 (U.S. CLS. 23, 28 AND 44).

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.

FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR  
DENTAL APPLICATIONS, IN CLASS 10 (U.S. CLS. 26, 39 AND 44).

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.



*David J. Kappas*

Director of the United States Patent and Trademark Office

THE MARK CONSISTS OF THE COLOR TEAL AND THE CONFIGURATION OF A FUTURISTIC, DOME-FAÇADE TIP HAVING A SMOOTH BOTTOM PORTION, A SLIGHTLY INDENTED MIDDLE PORTION, AN UPPER PORTION ANGLED INWARDLY WHICH NARROWS AND RESTRICTS TO A TOP PORTION THAT ATTACHES TO A TRANSPARENT STEM WHICH ENCASES A CORKSCREW LIKE ELEMENT. THE DOTTED OUTLINE OF THE BOTTOM TAB AND TOP TABS ON THE DOME-FAÇADE TIP, THE SLIGHTLY INDENTED MIDDLE PORTION CONSISTING OF UNIFORM CONTINUOUS RIDGES, THE STEM AND THE CORKSCREW LIKE ELEMENT IS INTENDED TO SHOW POSITION OF THE MARK ON THE GOODS AND IS NOT PART OF THE MARK.

THE COLOR(S) TEAL IS/ARE CLAIMED AS A FEATURE OF THE MARK.



**Reg. No. 3,762,233** SEC. 2(F).

SER. NO. 77-623,884, FILED 12-1-2008.

NORA BUCHANAN WILL, EXAMINING ATTORNEY

# United States of America

United States Patent and Trademark Office



**Reg. No. 3,976,379**

**Registered June 14, 2011**

**Int. Cl.: 10**

**TRADEMARK**

**PRINCIPAL REGISTER**

SULZER MIXPAC AG (SWITZERLAND CORPORATION)  
RÜTISTRASSE 7  
HAAG (RHEINTAL), SWITZERLAND CH-9469

FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR DENTAL APPLICATIONS, IN CLASS 10 (U.S. CLS. 26, 39 AND 44).

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.

THE MARK CONSISTS OF THE COLOR BLUE AND THE CONFIGURATION OF A FUTURISTIC, DOME-FACADE TIP HAVING A SMOOTH BOTTOM PORTION, A SLIGHTLY INDENTED MIDDLE PORTION, AN UPPER PORTION ANGLED INWARDLY WHICH NARROWS AND RESTRICTS TO A TOP PORTION THAT ATTACHES TO A TRANSPARENT STEM WHICH ENCASES A CORKSCREW LIKE ELEMENT. THE DOTTED OUTLINE OF THE BOTTOM TAB AND TOP TABS ON THE DOME-FACADE TIP, THE SLIGHTLY INDENTED MIDDLE PORTION CONSISTING OF UNIFORM CONTINUOUS RIDGES, THE STEM AND THE CORKSCREW LIKE ELEMENT IS INTENDED TO SHOW POSITION OF THE MARK ON THE GOODS AND IS NOT PART OF THE MARK.

THE COLOR(S) BLUE IS/ARE CLAIMED AS A FEATURE OF THE MARK.

SEC. 2(F).

SER. NO. 77-848,301, FILED 10-14-2009.

NORA BUCHANAN WILL, EXAMINING ATTORNEY

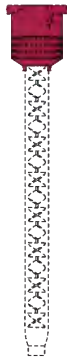


*David J. Kyffers*

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# United States of America

United States Patent and Trademark Office



**Reg. No. 3,976,380**

**Registered June 14, 2011**

**Int. Cl.: 10**

SULZER MIXPAC AG (SWITZERLAND CORPORATION)  
RÜTISTRASSE 7  
HAAG (RHEINTAL), SWITZERLAND CH-9469

FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR DENTAL APPLICATIONS, IN CLASS 10 (U.S. CLS. 26, 39 AND 44).

**TRADEMARK**

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.

**PRINCIPAL REGISTER**

THE MARK CONSISTS OF THE COLOR PINK AND THE CONFIGURATION OF A FUTURISTIC, DOME-FACADE TIP HAVING A SMOOTH BOTTOM PORTION, A SLIGHTLY INDENTED MIDDLE PORTION, AN UPPER PORTION ANGLED INWARDLY WHICH NARROWS AND RESTRICTS TO A TOP PORTION THAT ATTACHES TO A TRANSPARENT STEM WHICH ENCASES A CORKSCREW LIKE ELEMENT. THE DOTTED OUTLINE OF THE BOTTOM TAB AND TOP TABS ON THE DOME-FACADE TIP, THE SLIGHTLY INDENTED MIDDLE PORTION CONSISTING OF UNIFORM CONTINUOUS RIDGES, THE STEM AND THE CORKSCREW LIKE ELEMENT IS INTENDED TO SHOW POSITION OF THE MARK ON THE GOODS AND IS NOT PART OF THE MARK.

THE COLOR(S) PINK IS/ARE CLAIMED AS A FEATURE OF THE MARK.

SEC. 2(F).

SER. NO. 77-848,315, FILED 10-14-2009.

NORA BUCHANAN WILL, EXAMINING ATTORNEY

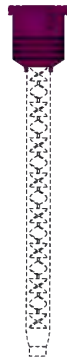


*David J. Kyfas*

Director of the United States Patent and Trademark Office

# United States of America

United States Patent and Trademark Office



**Reg. No. 3,976,381**

**Registered June 14, 2011**

**Int. Cl.: 10**

**TRADEMARK**

**PRINCIPAL REGISTER**

SULZER MIXPAC AG (SWITZERLAND CORPORATION)  
RÜTISTRASSE 7  
HAAG (RHEINTAL), SWITZERLAND CH-9469

FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR DENTAL APPLICATIONS, IN CLASS 10 (U.S. CLS. 26, 39 AND 44).

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.

THE MARK CONSISTS OF THE COLOR PURPLE AND THE CONFIGURATION OF A FUTURISTIC, DOME-FACADE TIP HAVING A SMOOTH BOTTOM PORTION, A SLIGHTLY INDENTED MIDDLE PORTION, AN UPPER PORTION ANGLED INWARDLY WHICH NARROWS AND RESTRICTS TO A TOP PORTION THAT ATTACHES TO A TRANSPARENT STEM WHICH ENCASES A CORKSCREW LIKE ELEMENT. THE DOTTED OUTLINE OF THE BOTTOM TAB AND TOP TABS ON THE DOME- FACADE TIP, THE SLIGHTLY INDENTED MIDDLE PORTION CONSISTING OF UNIFORM CONTINUOUS RIDGES, THE STEM AND THE CORKSCREW LIKE ELEMENT IS INTENDED TO SHOW POSITION OF THE MARK ON THE GOODS AND IS NOT PART OF THE MARK.

THE COLOR(S) PURPLE IS/ARE CLAIMED AS A FEATURE OF THE MARK.

SEC. 2(F).

SER. NO. 77-848,320, FILED 10-14-2009.

NORA BUCHANAN WILL, EXAMINING ATTORNEY

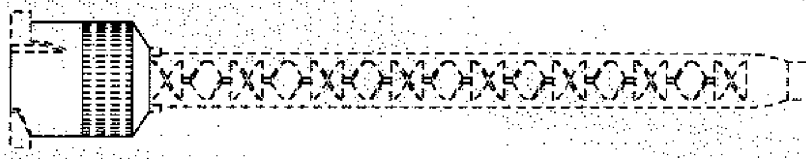


*David J. Kyffers*

Director of the United States Patent and Trademark Office

# United States of America

United States Patent and Trademark Office



**Reg. No. 4,051,261**

**Registered Nov. 8, 2011**

**Int. Cl.: 10**

SULZER MIXPAC AG (SWITZERLAND CORPORATION)  
RÜTISTRASSE 7  
HAAG (RHEINTAL), SWITZERLAND CH9469

FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR DENTAL APPLICATIONS, IN CLASS 10 (U.S. CLS. 26, 39 AND 44).

**TRADEMARK**

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.

**PRINCIPAL REGISTER**

OWNER OF U.S. REG. NOS. 3,762,232 AND 3,762,233.

THE MARK CONSISTS OF THE CONFIGURATION OF A FUTURISTIC, DOME-FACADE TIP HAVING A SMOOTH BOTTOM PORTION, A SLIGHTLY INDENTED MIDDLE PORTION, AN UPPER PORTION ANGLED INWARDLY WHICH NARROWS AND RESTRICTS TO A TOP PORTION THAT ATTACHES TO A TRANSPARENT STEM WHICH ENCASES A CORKSCREW LIKE ELEMENT. THE DOTTED OUTLINE OF THE BOTTOM TAB AND TOP TABS ON THE DOME-FACADE TIP, THE SLIGHTLY INDENTED MIDDLE PORTION CONSISTING OF UNIFORM CONTINUOUS RIDGES, THE STEM AND THE CORKSCREW LIKE ELEMENT IS INTENDED TO SHOW POSITION OF THE MARK ON THE GOODS AND IS NOT PART OF THE MARK.

SEC. 2(F).

SER. NO. 77-848,340, FILED 10-14-2009.

ANN E. SAPPENFIELD, EXAMINING ATTORNEY



*David J. Kyfas*

Director of the United States Patent and Trademark Office

**REQUIREMENTS TO MAINTAIN YOUR FEDERAL  
TRADEMARK REGISTRATION**

**WARNING: YOUR REGISTRATION WILL BE CANCELLED IF YOU DO NOT FILE THE  
DOCUMENTS BELOW DURING THE SPECIFIED TIME PERIODS.**

**Requirements in the First Ten Years\***

**What and When to File:**

**First Filing Deadline:** You must file a Declaration of Use (or Excusable Nonuse) between the 5th and 6th years after the registration date. *See* 15 U.S.C. §§1058, 1141k. If the declaration is accepted, the registration will continue in force for the remainder of the ten-year period, calculated from the registration date, unless cancelled by an order of the Commissioner for Trademarks or a federal court.

**Second Filing Deadline:** You must file a Declaration of Use (or Excusable Nonuse) **and** an Application for Renewal between the 9th and 10th years after the registration date.\*  
*See* 15 U.S.C. §1059.

**Requirements in Successive Ten-Year Periods\***

**What and When to File:**

You must file a Declaration of Use (or Excusable Nonuse) **and** an Application for Renewal between every 9th and 10th-year period, calculated from the registration date.\*

**Grace Period Filings\***

The above documents will be accepted as timely if filed within six months after the deadlines listed above with the payment of an additional fee.

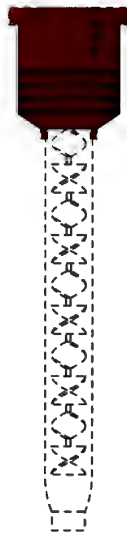
**The United States Patent and Trademark Office (USPTO) will NOT send you any future notice or reminder of these filing requirements.**

**\*ATTENTION MADRID PROTOCOL REGISTRANTS:** The holder of an international registration with an extension of protection to the United States under the Madrid Protocol must timely file the Declarations of Use (or Excusable Nonuse) referenced above directly with the USPTO. The time periods for filing are based on the U.S. registration date (not the international registration date). The deadlines and grace periods for the Declarations of Use (or Excusable Nonuse) are identical to those for nationally issued registrations. *See* 15 U.S.C. §§1058, 1141k. However, owners of international registrations do not file renewal applications at the USPTO. Instead, the holder must file a renewal of the underlying international registration at the International Bureau of the World Intellectual Property Organization, under Article 7 of the Madrid Protocol, before the expiration of each ten-year term of protection, calculated from the date of the international registration. *See* 15 U.S.C. §1141j. For more information and renewal forms for the international registration, see <http://www.wipo.int/madrid/en/>.

**NOTE: Fees and requirements for maintaining registrations are subject to change. Please check the USPTO website for further information. With the exception of renewal applications for registered extensions of protection, you can file the registration maintenance documents referenced above online at <http://www.uspto.gov>.**

# United States of America

United States Patent and Trademark Office



**Reg. No. 3,976,382**

**Registered June 14, 2011**

**Int. Cl.: 10**

**TRADEMARK**

**PRINCIPAL REGISTER**



SULZER MIXPAC AG (SWITZERLAND CORPORATION)  
RÜTISTRASSE 7  
HAAG (RHEINTAL), SWITZERLAND CH-9469

FOR: MIXING TIPS USED WITH DISPENSERS OF TWO PART COMPOSITIONS FOR DENTAL APPLICATIONS, IN CLASS 10 (U.S. CLS. 26, 39 AND 44).

FIRST USE 12-31-1997; IN COMMERCE 12-31-1997.

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THE COLOR(S) BROWN IS/ARE CLAIMED AS A FEATURE OF THE MARK.

SEC. 2(F).

SER. NO. 77-848,338, FILED 10-14-2009.

NORA BUCHANAN WILL, EXAMINING ATTORNEY

*David J. Kyfas*

Director of the United States Patent and Trademark Office

## EXHIBIT B



★ PRODUCTS

Dental Device

Dental Handpiece

Dental X-ray

Dental Disposable

- cheek retractor
- Cotton Roll Dispenser
- Denture Box and Transportation Box
- Dental Applicator
- Dental Lab Mixing Cup
- Dental Instrument Kits
- Dental Plastic Wedges
- Face mask
- Dental Tray
- Dental Safty Glasses, Face shield,Eyewear
- Dental Mixture Tips
- Dental Spatula
- Dental Syringe ,Syringe tips,Suction and salivaTube
- Dental Tips Holder
- Dental Impress Tray
- Dental Cotton and Paper-Plastic Products
- Disposable Sleeve
- Disposable Gloves
- Disposable Others

Dental Burs

Dental Lab

Medical System

Products

[Home >> Product](#)

Dental Disposable - Dental Mixture Tips



DMP01-A



DMP01-B



DMP01-C



DMP01-D



DMP01-E



DMP01-F



DMP01-G



DMP01-H



DMP01-I



DMP02-A



DMP02-B



DMP02-C

## EXHIBIT C



US005609271A

**United States Patent** [19]**Keller et al.**[11] **Patent Number:** **5,609,271**[45] **Date of Patent:** **Mar. 11, 1997**

[54] **MIXER AND MULTIPLE COMPONENT DISPENSING DEVICE ASSEMBLY AND METHOD FOR THE ALIGNED CONNECTION OF THE MIXER TO THE MULTIPLE COMPONENT DISPENSING DEVICE**

[75] Inventors: **Wilhelm A. Keller**, Obstgartenweg 9,  
CH-6402 Merlischachen, Switzerland;  
**Richard J. Wilson**, Andover, Mass.

[73] Assignee: **Wilhelm A. Keller**, Merlischachen,  
Switzerland

[21] Appl. No.: **522,108**

[22] Filed: **Aug. 31, 1995**

**Related U.S. Application Data**

[63] Continuation of Ser. No. 378,000, Jan. 25, 1995, abandoned.

[30] **Foreign Application Priority Data**

Aug. 24, 1995 [EP] European Pat. Off. .... 95810530

[51] Int. Cl.<sup>6</sup> ..... **B67D 5/60**

[52] U.S. Cl. .... **222/145.6**

[58] Field of Search ..... 222/137, 145.1,  
222/145.6, 570, 568; 366/339

[56] **References Cited****U.S. PATENT DOCUMENTS**

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(List continued on next page.)

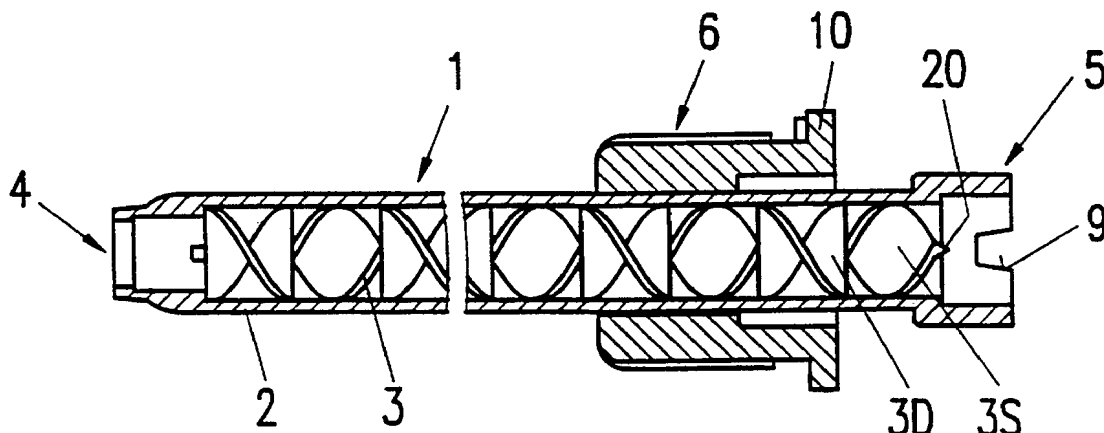
**FOREIGN PATENT DOCUMENTS**

2232910A 1/1991 United Kingdom .

*Primary Examiner*—Philippe Derakshani  
*Attorney, Agent, or Firm*—Richard Linn

[57] **ABSTRACT**

The mixer of the mixer-cartridge assembly comprises a housing, an inlet section having an individual inlet for each outlet of the cartridge and a mixer element group. The mixer inlet section comprising a separating element and the mixer element group are arranged thus, that while sealingly connecting the mixer to the cartridge, the inlets of the mixer remain aligned with the corresponding and matching outlets of the cartridge as well as with the separating element and with the dividing element of the mixer element group for optimizing the mixing of the components. For mixer attachment, the mixer housing comprises bayonet lugs cooperating with bayonet prongs on the cartridge, whereby the housing is rotated while the mixer inlet section, separating element and element group do not rotate in regard to the cartridge outlets, thus avoiding cross-contamination of the components at the cartridge/mixer interface and assuring continued separation well into the mixer up to the first dividing element.

**14 Claims, 7 Drawing Sheets**

**5,609,271**

Page 2

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			5,413,253	5/1995	Simmen .

U.S. Patent

Mar. 11, 1997

Sheet 1 of 7

5,609,271

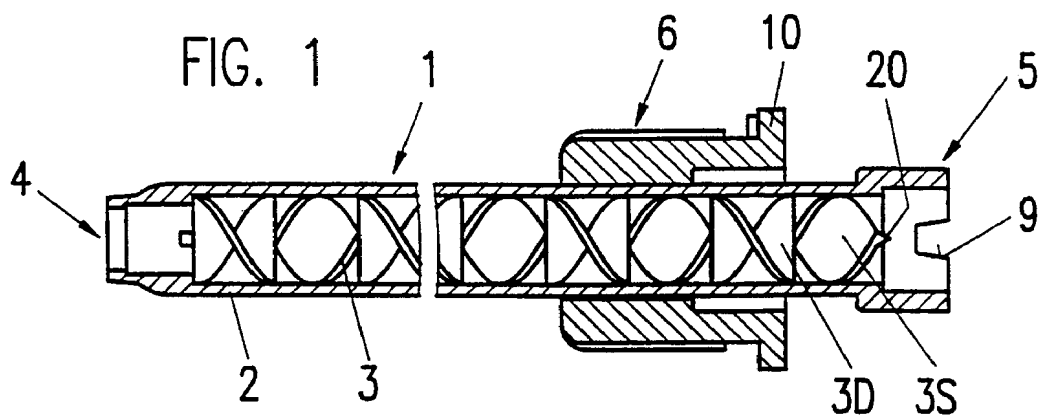


FIG. 2

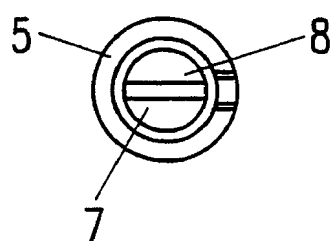


FIG. 3

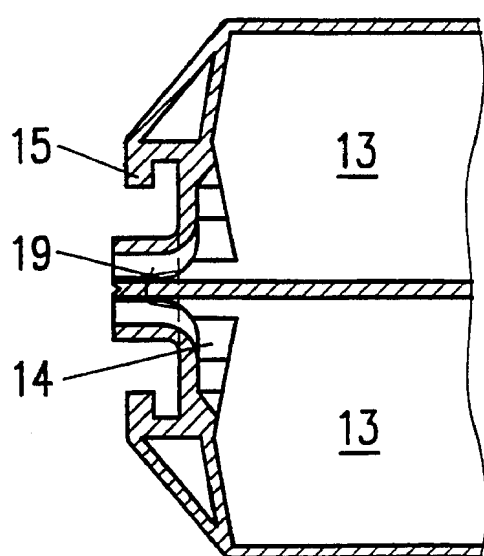


FIG. 5

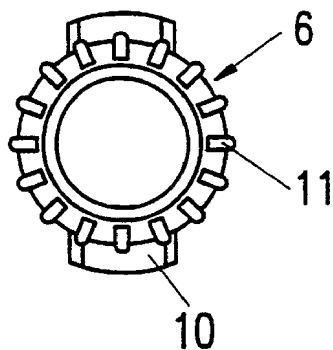


FIG. 4

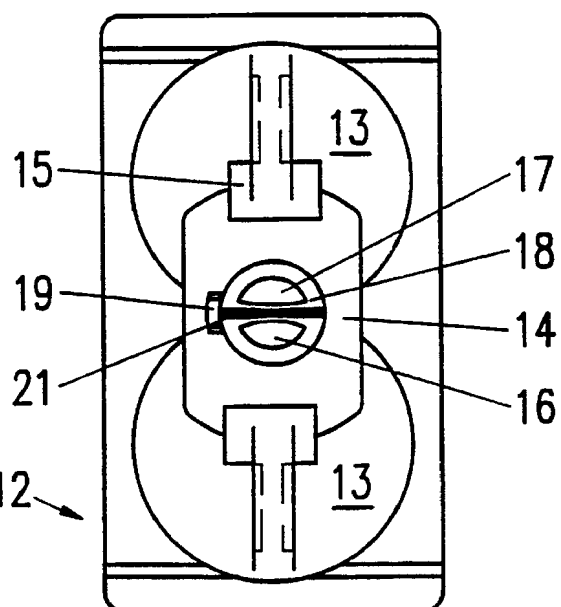


FIG. 6A

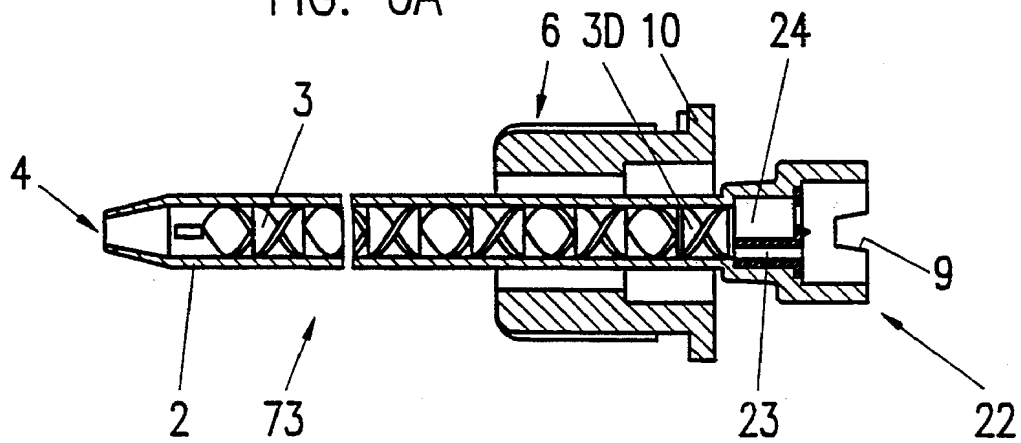


FIG. 6B

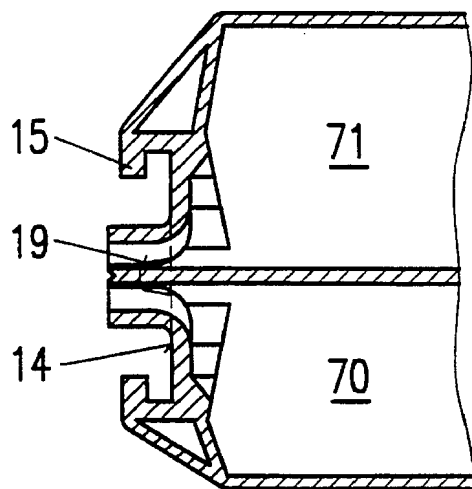
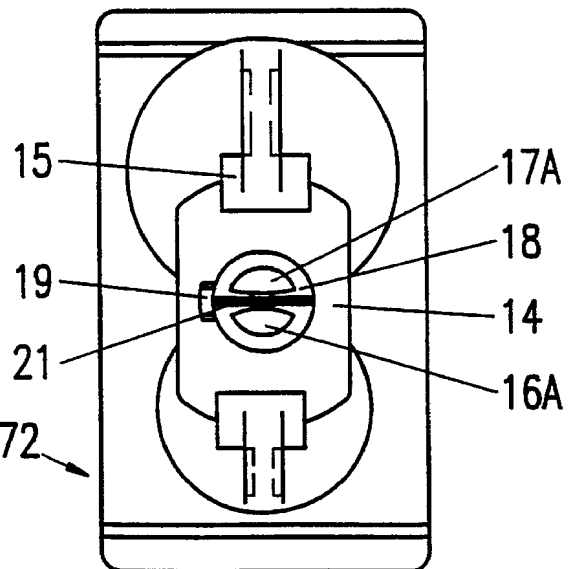


FIG. 6C



U.S. Patent

Mar. 11, 1997

Sheet 3 of 7

5,609,271

FIG. 7

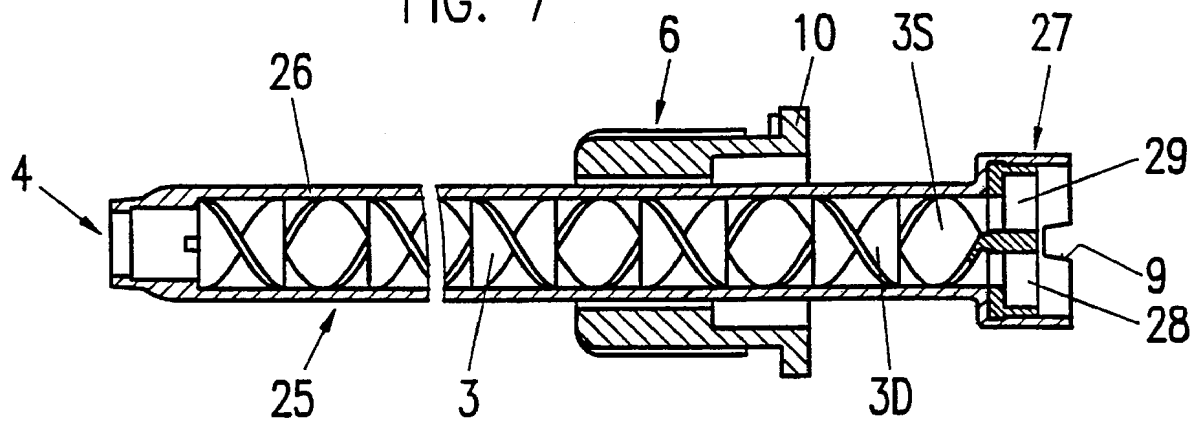


FIG. 8

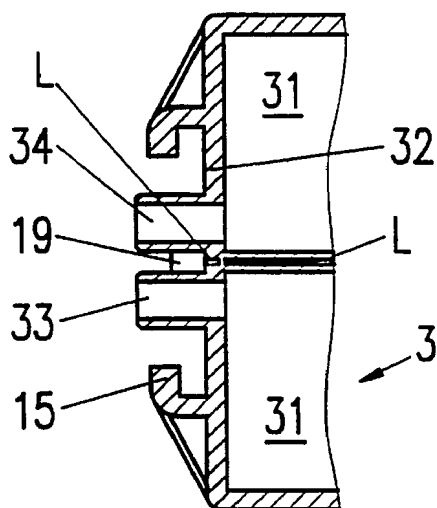


FIG. 9

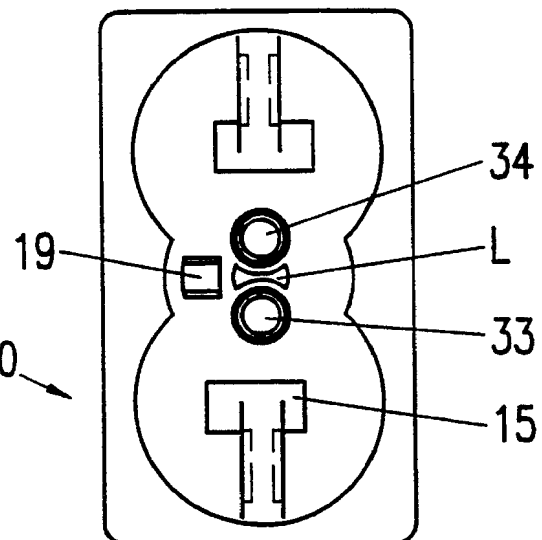
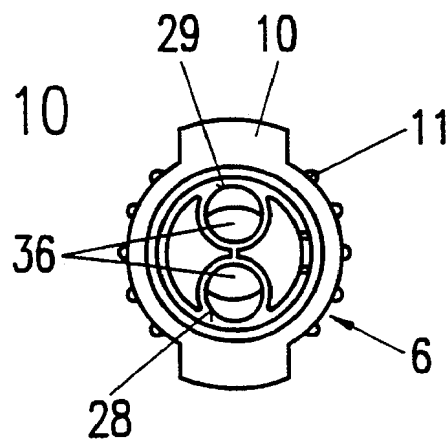


FIG. 10



**U.S. Patent**

Mar. 11, 1997

Sheet 4 of 7

**5,609,271**

FIG. 11A

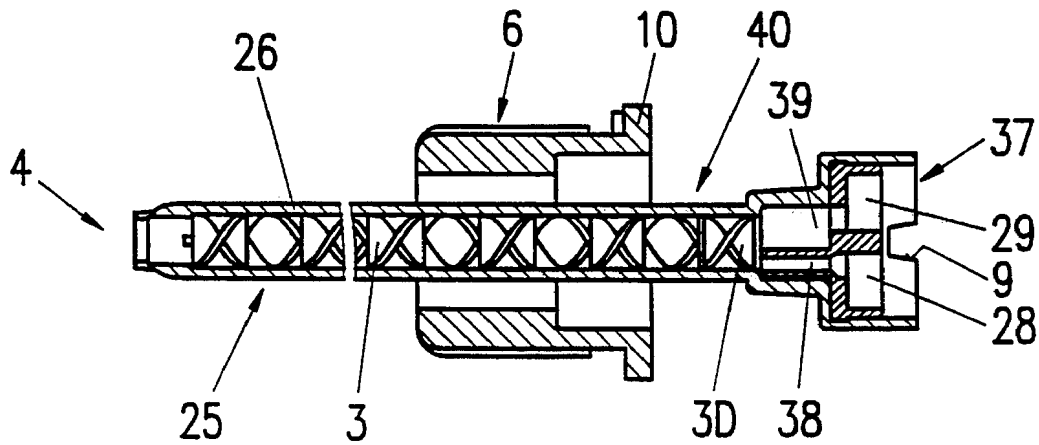


FIG. 11B

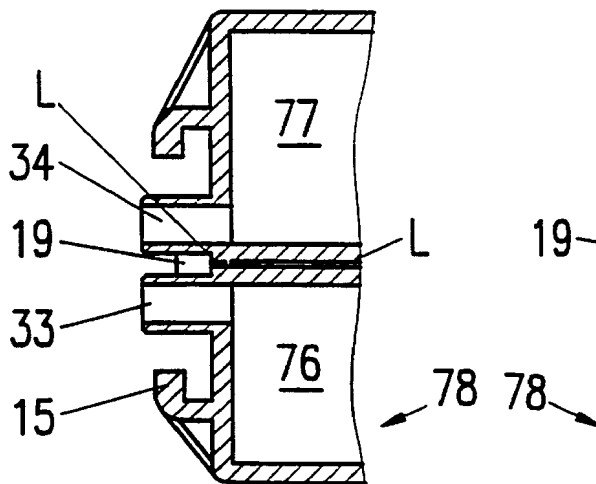


FIG. 11C

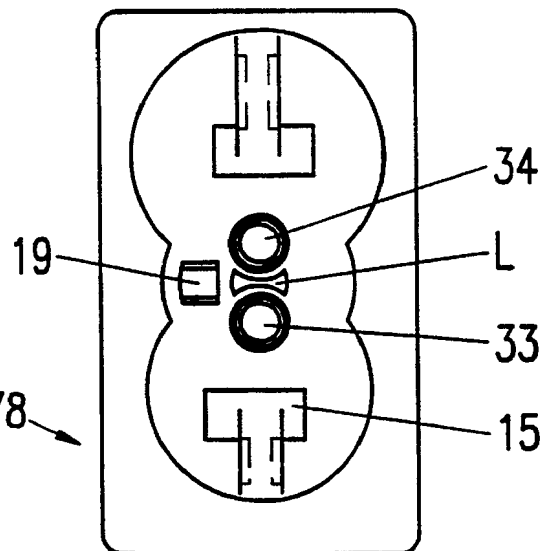




FIG. 12

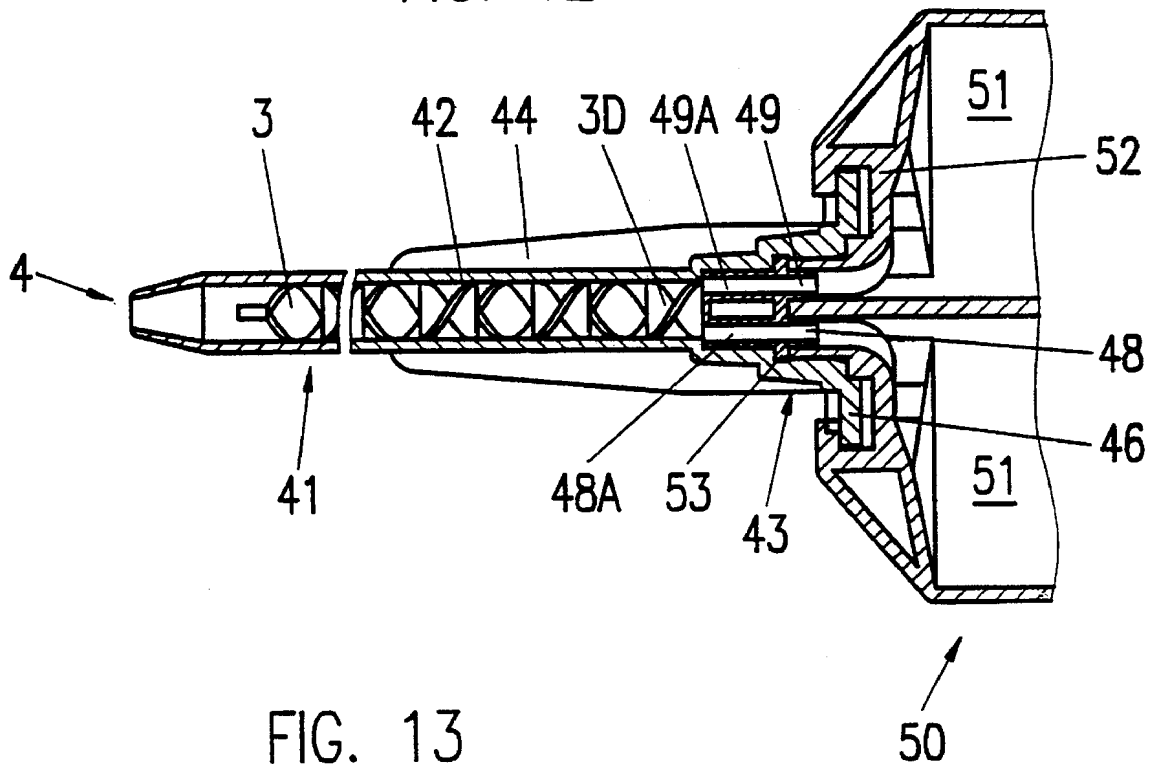


FIG. 13

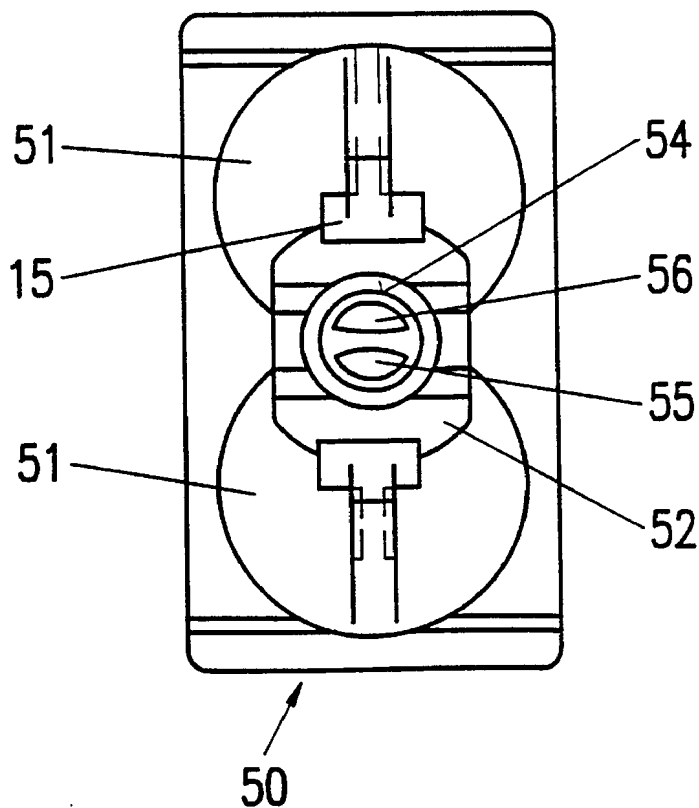
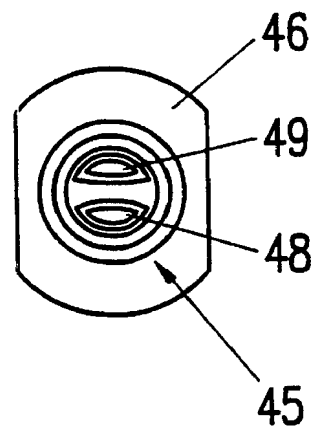


FIG. 14

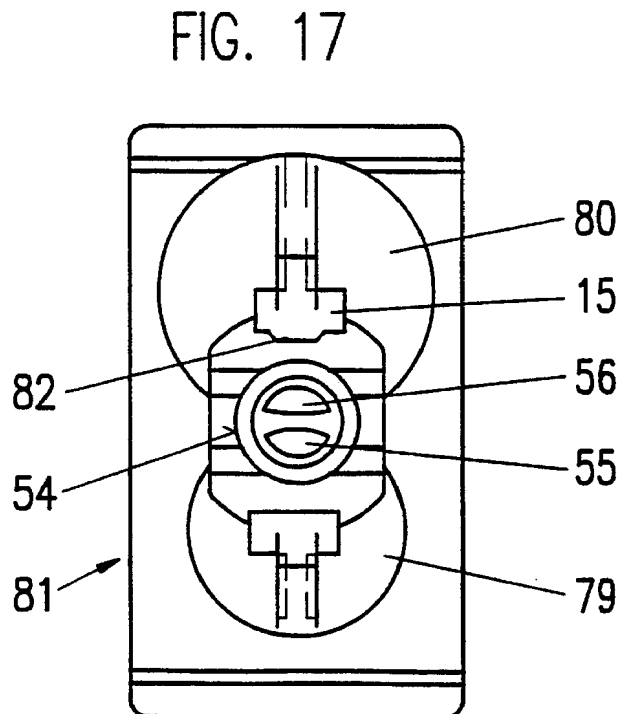
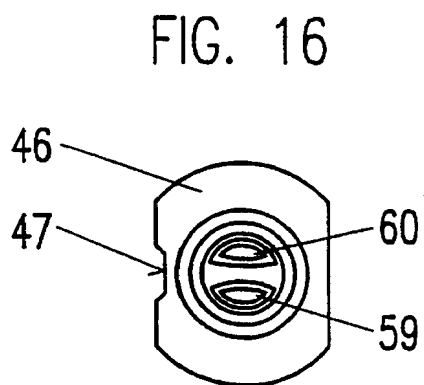
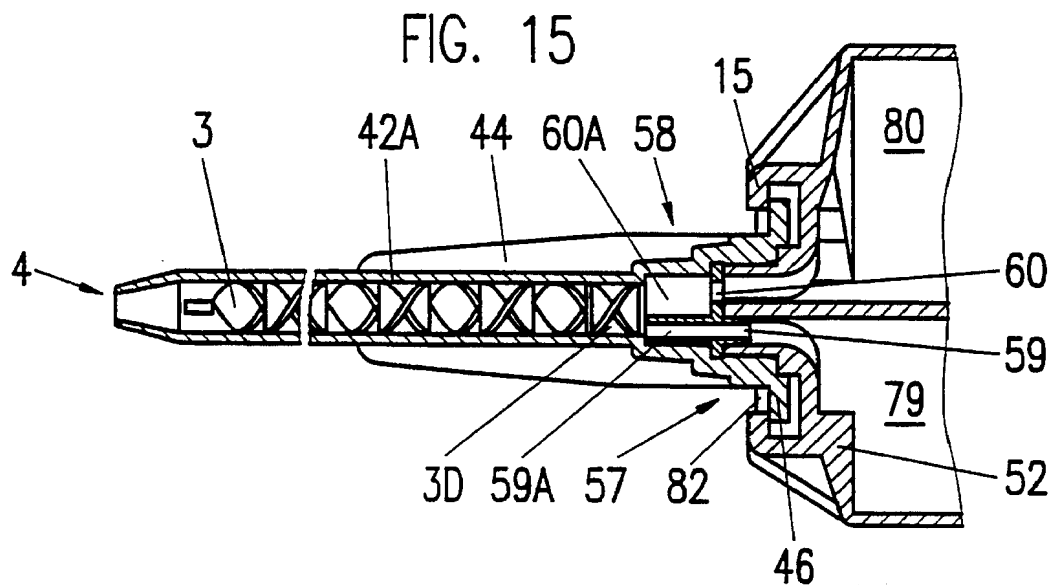


U.S. Patent

Mar. 11, 1997

Sheet 6 of 7

5,609,271



U.S. Patent

Mar. 11, 1997

Sheet 7 of 7

5,609,271

FIG. 18

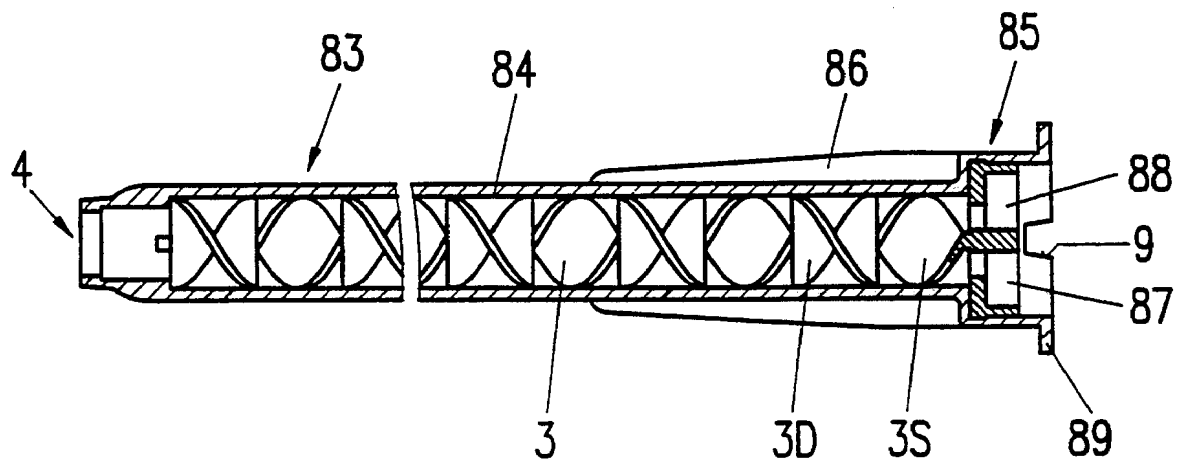
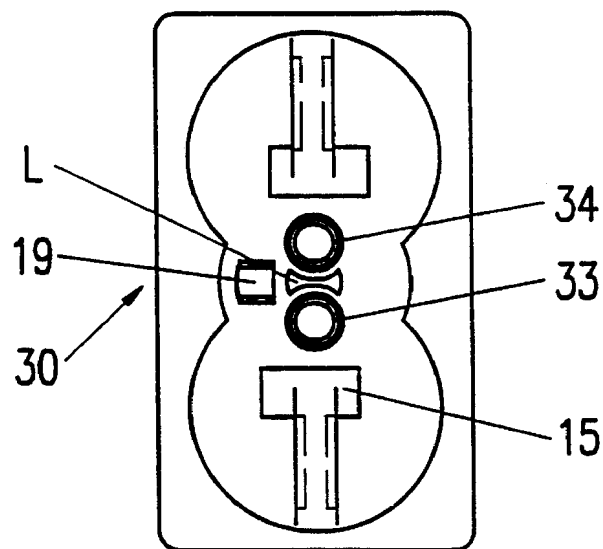


FIG. 19



5,609,271

1

**MIXER AND MULTIPLE COMPONENT  
DISPENSING DEVICE ASSEMBLY AND  
METHOD FOR THE ALIGNED  
CONNECTION OF THE MIXER TO THE  
MULTIPLE COMPONENT DISPENSING  
DEVICE**

The present patent application is a continuation in part of patent application Ser. No. 08/378,000 filed Jan. 25, 1995, now abandoned.

**BACKGROUND OF THE INVENTION**

The present invention relates to a mixer and a multiple reactive component dispensing device assembly, in particular a two-component cartridge, the mixer comprising a mixer housing, a mixer element group, a mixer inlet section having separate inlets for each outlet of the cartridge, the cartridge comprising at least two containers and an outlet area with separate outlets for each container, the mixer and the cartridge being provided with cooperating attaching means.

There exists a great number of mixers and cartridges having means for connecting and attaching the mixer to the cartridge, e.g. according to U.S. Pat. No. 4,767,026 or U.S. Pat. No. 4,538,920 where the mixer has two bayonet locking lugs insertable into corresponding prongs on the cartridge. The rotary locking movement will cause contamination of one component against the other component at the interface between the cartridge and the mixer in that these components will be transported from one outlet to the other outlet, or from one inlet to the other inlet, causing an undesired reaction between them at the interface between cartridge and mixer and eventually carrying such a reaction back into the cartridge outlets, thus causing plugging of the outlets.

U.S. Pat. No. 5,228,599 discloses a multiple component dispensing cartridge having a mixer attached thereto with the aid of a coupling nut having an internal thread, wherein each storage cylinder ends in a dispensing opening which forms a common outlet, whereas the inlet of the mixer is not defined. The mixer is put on the cartridge and secured with the coupling nut screwed on an external thread at the cartridge.

DE-U-94 05 922 discloses a two component cartridge wherein the containers are arranged concentrically and whereas the outlets are side by side and D-shaped. For better discharge of the residual material two sleeves are connected to the mixer. These sleeves, however, do not prevent cross-contamination of the two components while connecting or disconnecting the mixer to and from the cartridge.

There is also a tendency towards components with faster reactivity for quicker end use, which causes greater problems with materials of construction of the package, chemical migration through the separating wall from part of the package to another and hence unwanted reaction within the package.

Cartridges separated by one single wall, e.g. according to U.S. Pat. No. 5,333,760, cannot exclude chemical migration through such a single wall separation barrier and therefore separation at the cartridge outlets is not sufficient if a reaction takes place during storage within the cylinders.

**SUMMARY OR THE INVENTION**

On the basis of this prior art, it is an object of the present invention to provide for a mixer and a multiple reactive component dispensing device assembly and a method for the

2

aligned connection of that mixer to the multiple reactive component dispensing device which, during attachment, avoids cross-contamination by keeping the reactive components separated from the cartridge outlets well into the mixer, at the same time providing for optimum mixing efficiency.

This object is attained by a mixer and a multiple reactive component dispensing device assembly wherein said mixer inlet section of the mixer comprises separating means for maintaining separation of the components beyond the separate inlets, the mixer element group and the inlet section being arranged such, that while sealingly connecting the mixer to the cartridge, the inlets of the mixer inlet section remain aligned with the corresponding and matching outlets of the cartridge and the separating means are —after attaching the mixer assembly —aligned with the first dividing element of the mixer element group.

It is a further object of the invention to provide for a cartridge which assures a total chemical separation along the whole length from where the chemicals are contained, ahead of the cylinder pistons, all the way through to the top of the outlets where, during storage, a closure means is installed. This further object is attained with a cartridge wherein the containers and outlets are substantially separated by an air gap in between.

The invention will be explained in more detail hereinafter with reference to a drawing of embodiments.

**BRIEF DESCRIPTION OF THE DRAWINGS**

FIGS. 1–5 show a first embodiment of the invention comprising a coupling ring, wherein

FIG. 1 is a section of a mixer,

FIG. 2 is a view on the inlet end of the mixer,

FIG. 3 is a side view of the outlet part of a cartridge with side by side outlets,

FIG. 4 is a top view of the cartridge of FIG. 2,

FIG. 5 is a top view of the coupling ring,

FIGS. 6A–6C show a variant of the mixer of the first embodiment with different separating means and a cartridge with two containers having different volumes,

FIGS. 7–10 show a second embodiment of the invention employing a coupling ring, wherein

FIG. 7 is a section of a mixer,

FIG. 8 is a side view of the outlet part of a cartridge with distanced outlets,

FIG. 9 is a top view of the cartridge of FIG. 8,

FIG. 10 is a view on the inlet end of the mixer with the coupling ring, FIGS. 11A–11C show a variant of the mixer of the second embodiment with separating means and a cartridge with two containers having different volumes and distanced outlets,

FIGS. 12–14 show a third embodiment of the invention with a rotatable mixer housing, wherein

FIG. 12 is a partial section of a mixer and a side view of the outlet part of a cartridge with side by side outlets,

FIG. 13 is a top view of the cartridge of FIG. 12,

FIG. 14 is a view on the inlet end of the mixer,

FIGS. 15–17 show a variant of the mixer of FIG. 12 with two containers having different volumes, and

FIGS. 18 and 19 show a preferred embodiment of the invention in a partial section of a mixer and a top view of the outlet area of the cartridge.

5,609,271

3

## DETAILED DESCRIPTION OF THE INVENTION

FIG. 1 shows in a first embodiment a mixer 1 comprising a mixer housing 2, a mixer element group 3, a mixer outlet 4 and a mixer inlet section 5. This mixer is fixed to the cartridge with the aid of a coupling ring 6. It follows in particular from FIG. 2 that the mixer inlet section 5 forms two D-shaped, individual inlet openings 7 and 8 at the face of the mixer separating element 3S serving in this embodiment as a separating means for guiding each component separately to the first dividing element 3D of the mixer element group 3. A slot 9 aligns the mixer in regard to the cartridge.

As in this case and all further similar mixer embodiments without separated chambers, the separating element 3S of the mixer element group is arranged such that its leading edge 20, see FIG. 1, is in line with the plane separating the two inlets and the next element, which is the first dividing element 3D, is at 90° to it such that its leading edge divides the two component streams evenly for optimum mixing.

At the mixer inlet end facing the cartridge, the coupling ring 6 see FIG. 5 is provided with two bayonet lugs 10 and, for better manual gripping, ribs 11, on the outer cylindrical surface.

With cartridge 12, see FIGS. 3 and 4, only the outlet area is shown, the cartridge comprising two cylindrical containers 13, a connecting flange 14 with two bayonet prongs 15 receiving the bayonet lugs 10 of the mixer. The two individual, side by side outlets 16 and 17 are contained within an outlet tube 18 comprising a nose piece 19 cooperating with slot 9 at the inlet of the mixer 1 for aligning the mixer 1 to the cartridge 12. The openings of the side by side outlets 16 and 17 of the cartridge correspond to the two D-shaped individual mixer inlet openings 7 and 8 formed by the leading edge 20 of the separating element 3S. The cylindrical mixer inlet section 5 is formed for a sealing connection with the cartridge outlet tube 18 while fitting over the nose piece 19 of the cartridge.

It is important to note that when the mixer 1 is attached to the cartridge 12, both chemical component streams leaving the side by side outlets 16 and 17 of the cartridge are separated by the first separating mixer element 3S so that no chemical component material flow is possible from one cartridge outlet 16 across to the other cartridge outlet 17. Leading edge 20 of the separating element 3S of mixer element group 3, facing the cartridge outlet tube 18, fits and is pressed onto the surface or into the groove 21 between the two side by side outlets 16 and 17 and ensures component separation. Thus, separation of the components is maintained until the components reach the first dividing element 3D of the mixer element group.

When connecting the mixer 1 to the cartridge 12 the nose piece 19 on the cartridge can only fit into slot 9 of the mixer inlet section 5. This coded connection method assures not only one alignment possibility but also axial mixer attachment without rotation, thus preventing contamination of one chemical component by the other at the side by side outlets. The bayonet lugs 10 of the coupling ring 6 enable a quick attachment of the mixer.

FIGS. 6A–C show a variant to the embodiment shown in FIGS. 1–5 in that container 70 with outlet 16A of cartridge 72 has a smaller cross-sectional area than container 71 with outlet 17A. Also the mixer inlet section 22 has a separating means within the mixer 73 and comprises separated inlet chambers 23 and 24 having different cross-sectional areas and a smaller combined diameter than the cartridge outlet.

4

This alternative separating means can have separated inlet chambers with equal cross-sectional areas or other than 1:1. For example, the ratio of the cross-sectional areas of the separated inlet chambers can be adapted relative to cross-sectional areas of the containers of the cartridge, or to its metering ratio. In this embodiment the separating means is fixedly connected to the mixer element group.

FIG. 7 shows in a second embodiment mixer 25 comprising a mixer housing 26, the mixer element group 3, the mixer outlet 4 but with a mixer inlet section 27 with two cylindrical, separate inlets 28 and 29 followed by the separating element 3S of mixer element group 3. This mixer is also connected to the cartridge with the aid of the coupling ring 6. The coupling ring 6 is the same as or similar to the coupling ring of the previous embodiment, comprising bayonet lugs 10. In this embodiment all mixer internal parts are integral with properly aligned mixer element group 3.

The cartridge 30 comprises two cylindrical containers 31 of equal cross-sectional area substantially separated by an air gap L, see FIGS. 8 and 9, an outlet face 32 with the two bayonet prongs 15 for receiving the bayonet lugs 10 of the coupling ring 6. Cartridge outlet face 32 comprises two distanced outlets 33 and 34 which correspond to the respective inside diameters of the separate mixer inlets 28 and 29, whereby they fit and seal over the outlets of the cartridge. Also in this embodiment, both the outlets of the cartridge and the inlets of the mixer are separated at a distance so that no chemical component flow is possible from one outlet (inlet) across to the other outlet (inlet). This arrangement, where the mixer inlets fit over the cartridge outlets, results in a smaller diameter of the mixer inlet section 27 than reversed arrangements with the same cross-sectional flow area of the cartridge outlets.

By providing a single piece cartridge with complete containers, in the form of cylinders which are separated by an air gap L in between, a total chemical separation, substantially along the whole length wherein the chemicals are contained ahead of the cylinder pistons and all the way to the top of the outlets, is both assured and maintained within the mixer inlet section up to the first dividing element 3D of the mixer element group 3.

The invention however, is not limited to air gap separated containers and applies as well to cartridges with containers separated by one single wall according to FIG. 3.

The separate inlets 28 and 29 (see FIG. 10 of the mixer) terminate in two separate inlets 36 leading to the separating element 3S. The method of the aligned connection of the mixer to the cartridge is axial and the same as the aforementioned without rotation of the separating means integral with mixer element group.

FIGS. 11A–C show a variant to the embodiment shown in FIGS. 7–10 in that the containers 76 and 77 of cartridge 78 have different cross-sectional areas and are also separated by an air gap L, see FIGS. 11B and 11C. The inlet section 37 of mixer 40 is similar to the mixer inlet section 27 of FIG. 6, whereby the separate inlets 28 and 29 each end in a separated inlet chamber 38 and 39, respectively of different cross-sectional areas so as to correspond to different cartridge metering ratios and are housed in a smaller diameter with reference to the mixer inlet section 37 and terminating in an outlet opening for each chamber for material to pass through. This arrangement is preferable for, but not limited to, mixing ratios other than 1:1. Distanced outlets 33 and 34 and separate inlets 28 and 29 can also be of different cross-sections to reflect the different cross-sectional areas of the cartridge containers.



5,609,271

5

FIG. 12 shows, in a further embodiment, mixer 41 comprising a mixer housing 42, the mixer element group 3, the mixer outlet 4 and a mixer inlet section 43 with the separated inlets 48 and 49 leading to the separated chambers 48A and 49A which are fixedly attached to a properly aligned separating element 3S of the mixer element group 3. This mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 42 of the mixer, whereas the mixer element group 3 and the separated chambers 48A and 49A do not rotate. The mixer housing is provided with longitudinal ribs 44 which end at a flange 45, the two lateral ends of which are formed as bayonet lugs 46 cooperating with the bayonet prongs 15 of the cartridge. The inner wall of the mixer inlet section 43 is stepped and the separated chambers are provided with a sealing flange 53.

The mixer element group 3 is connected to the separated chambers 48A and 49A. The sealing flange 53 is disposed in such a way within the housing that the housing itself is rotatable around the mixer element group 3 with attached separating means and combined separated inlets 48 and 49. The sealing flange 53 will provide sealing between the inlet section and the mixer housing containing the mixer element group.

The cartridge 50 comprises two cylindrical containers 51, and in this embodiment, a connecting flange 52 with the two bayonet prongs 15 for receiving the bayonet lugs 46 of the mixer 41. The stepped outlet nozzle 54 of the cartridge has two individual, separate D-shaped side by side outlets 55 and 56 which correspond to the respective outside shape of the separated inlets 48 and 49 of the mixer whereby they fit and seal into the outlets 55 and 56. Also in this embodiment both the outlets of the cartridge and the prealigned inlets of the mixer are connected axially such that no direct chemical component flow or contact is possible from one outlet across to the other outlet during attachment.

FIGS. 15–17 show a variant to the embodiment shown in FIGS. 12–14 in that the containers 79 and 80 of cartridge 81 have different cross-sectional areas. The mixer inlet section 57 of mixer 58 comprises a separated inlet 59 and an inlet opening 60 but each ending in separated chambers 59A and 60A with different cross-sections within a reduced diameter in comparison with the inlet section. This arrangement is preferable for mixing ratios other than 1:1, but not limited to them. For mixing ratios other than 1:1 it may be preferable to omit inlet part 49 of the major component which enters the mixer inlet section in order to adapt the cross-section of the flow path to the mixing ratio.

One longitudinal side between the bayonet lugs 46 has a recess 47 (see FIG. 16) and one of the bayonet prongs 15 has, at one of its lateral sides, a nose piece 82 for cooperating with that recess 47 for the coded alignment of the mixer to the cartridge.

There are other coding means possible at the dispensing apparatus or cartridge and at the accessory for the coded alignment of the accessory to the dispensing apparatus or cartridge, e.g. pins, protruding parts of all kind fitting into a recess or cavity or slot.

For attaching the mixer to the cartridge, the mixer is aligned and pressed onto the cartridge such that the nose 82 fits into recess 47 of the mixer flange and the inlets of the mixer fit into the outlets of the cartridge. When the mixer is in place and the outlets and inlets are connected, mixer housing 42 of the mixer is rotated by 90° for the engagement of the bayonet lugs 46 in the bayonet prongs of the cartridge. This method prevents the contamination of one chemical component by the other by avoiding relative rotation at the

6

mixer/cartridge interface and enables a quick attachment of the mixer.

The FIGS. 18 and 19 show a preferred embodiment, combining the distanced outlets 33 and 34 of cartridge 30, having also complete cylindrical containers substantially separated by an air gap L. A mixer 83, with a mixer housing 84, has a mixer inlet section 85 with separate inlets 87 and 88 integral with the separating element 3S attached to the mixer element group 3 ending at the mixer outlet 4. The mixer housing 84 is provided with ribs 86 ending in bayonet lugs 89 cooperating with bayonet prongs 15 at the cartridge. Corresponding separate inlets 87 and 88 of the mixer 83 fit over the distanced outlets 33 and 34 of the cartridge 30.

This mixer is fixed to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 84 of the mixer, whereas the separate inlets 87 and 88, the separating element 3S and the mixer element group 3, comprising the first dividing element 3D, do not rotate. It is evident that this embodiment can also be provided with separated chambers ending at the first dividing element.

All the above described embodiments have the advantage of being compact and result in low moulding and assembly costs since the whole inlet section, comprising the separating means and the mixer element group, is made in one piece. The integral construction of the internal parts ensures proper alignment thus providing optimum mixing efficiency.

In the situation where a relatively long mixer element group is used and where rotational friction between this group and the housing might cause problems, it may be preferable to separate a part or the whole mixer element group from the separating means of the inlet section such that a part or the whole mixer element group may be fixedly assembled within the housing and therefore rotates while connecting the mixer to the cartridge. In this case—and as seen from the mixer inlet to the mixer outlet—the leading edge of the first element of the mixer element group, or of the portion thereof fixedly assembled within the housing, must be assembled in a pre-aligned position such that after rotating the housing so as to attach the mixer to the cartridge, correct alignment is achieved such that each material stream leaving the separating means, or the first element group attached to the separating means, will be evenly divided by the leading edge of the first element of the element group, or portion thereof fixedly assembled within the housing, for optimizing mixing efficiency.

It is evident that instead of embodiments with D-shaped inlets and outlets, cylindrical, differently shaped, or dissimilar sized inlets and outlets are possible. Furthermore, the same principle can be used also for a dispensing device or cartridge dispensing more than two components.

It follows from the above description that the inventive mixer-cartridge combination provides, in particular for cartridge containers substantially separated by an air gap up to and including the individual outlets, a port to port coded alignment for same or dissimilar size ports, with no cross-contamination caused by rotation while also maintaining separation past the interface into the mixer so as to hinder the spreading of any possible reaction and plugging of the components at the interface and back into the cartridge outlets. This combination also provides optimization of the mixing performance, especially but not uniquely, for ratios other than 1:1.

While the foregoing description and the drawing of the cartridge embodiments pertained to multiple component cartridges with side-by-side containers, the teaching of the present invention is not limited thereto and can be applied as

5,609,271

7

well to cartridges with concentric containers or otherwise arranged and formed containers, having side by side or distanced outlets.

We claim:

1. A mixer and a multiple reactive component dispensing device assembly, in particular a two-component cartridge, the mixer comprising a mixer housing, a mixer element group, a mixer inlet section having separate inlets for each outlet of the cartridge, the cartridge comprising at least two containers and an outlet area with separate outlets for each container, the mixer and the cartridge being provided with cooperating attaching means, wherein said mixer inlet section of the mixer comprises separating means for maintaining separation of the components beyond the separate inlets, the mixer element group and the inlet section being arranged such, that while sealingly connecting the mixer to the cartridge, the inlets of the mixer inlet section remain aligned with the corresponding and matching outlets of the cartridge and the separating means are —after attaching the mixer —aligned with a first dividing element of the mixer element group.

2. A mixer according to claim 1, wherein said parts of the mixer inlet section including the separating means and the mixer element group are aligned and fixedly connected to each other.

3. A mixer according to claim 1, wherein said mixer element group or a portion of the mixer element group is fixedly assembled within said mixer housing with a leading edge of a first mixing element in a prealigned position, wherein said mixer element group or portion of the mixer element group and the inlet section of the mixer are arranged such that a rotation is possible between the inlet section and the mixer element group or portion of the mixer element group, whereby —as seen from the mixer inlet to the mixer outlet —after a rotation required to attach the mixer, the leading edge of the first mixing element of the mixer element group, or portion of the mixer element group, which is not fixedly attached to the inlet section, is aligned with the inlet section, or with a mixer element group portion attached to the inlet section, so as to evenly divide each material stream for optimum mixing efficiency.

4. A mixer according to claim 1, wherein—as seen from the mixer inlet to the mixer outlet—the first element of the mixer element group is arranged such that it serves as a separating means for maintaining separation of the components.

5. A mixer according to claim 1, wherein said separating means of the mixer inlet section consists of separated chambers leading to the first dividing element of the mixer element group.

6. A mixer according to claim 1, wherein said mixer housing, the mixer element group and the mixer inlet section are fixedly assembled together and are attached via a coupling ring to the dispensing device or cartridge.

8

7. A mixer according to claim 1, wherein said mixer element group and the mixer inlet section are fixedly connected and arranged in the mixer housing such that the housing is rotatable around the fixedly connected internal parts of the mixer during the attachment of the mixer to the dispensing device or cartridge.

8. A mixer according to claim 3, wherein said housing, along with said fixedly assembled mixer element group or portion of said mixer element group, is rotatable relative to the mixer inlet section and separating means while attaching the mixer to the dispensing device or cartridge.

9. A multiple reactive component dispensing device according to claim 1, wherein said outlets of the cartridge are separate and individual, arranged side by side or distanced and are approximately D-shaped or cylindrical.

10. A multiple reactive component dispensing device according to claim 1 or 9, wherein said containers and the outlets are substantially separated by an air gap in between.

11. An assembly according to claim 1, wherein said mixer housing and the outlet area of the cartridge are provided with mutual coding means for ensuring alignment of the mixer to the cartridge.

12. A multiple reactive component dispensing device, in particular a two-component cartridge according to claim 1, wherein said cartridge is a single piece cartridge composed of at least two complete containers with at least two separate outlets, substantially separated by an air gap in between.

13. A method for connecting the mixer of claim 1 to a multiple reactive component dispensing device in particular a cartridge, comprising the steps of:

fixedly assembling together the mixer housing, the mixer element group and the mixer inlet section:

engaging first the inlets of the mixer to the corresponding outlets of the dispensing device; and

then engaging a coupling ring to the cartridge in such a way that the inlets of the mixer remain aligned to the outlets of the cartridge, thus preventing cross-contamination of the components.

14. A method for connecting the mixer of claim 1 to a multiple reactive component dispensing device comprising the steps of:

fixedly connecting and arranging the mixer element group and the mixer inlet section in the mixer housing such that the housing is rotatable around the fixedly connected internal parts of the mixer during the attachment of the mixer to the cartridge;

engaging first the inlets of the mixer to the corresponding outlets of the cartridge; and

then rotating the housing of the mixer for engaging its attaching means to the attaching means of the cartridge in such a way that the inlets of the mixer stay aligned to the outlets of the cartridge, thus preventing cross-contamination of the components.

\* \* \* \* \*

## EXHIBIT D





US005918772A

**United States Patent** [19][11] **Patent Number:** **5,918,772****Keller et al.**[45] **Date of Patent:** **\*Jul. 6, 1999**

- [54] **BAYONET FASTENING DEVICE FOR THE ATTACHMENT OF AN ACCESSORY TO A MULTIPLE COMPONENT CARTRIDGE OR DISPENSING DEVICE**
- [75] Inventors: **Wilhelm A. Keller**, Obstgartenweg 9, CH-6402 Merlischachen, Switzerland; **Richard J. Wilson**, Andover, Mass.
- [73] Assignee: **Wilhelm A. Keller**, Merlischachen, Switzerland
- [\*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

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[21] Appl. No.: **08/563,109**[22] Filed: **Nov. 27, 1995****Related U.S. Application Data**

- [63] Continuation-in-part of application No. 08/403,172, Mar. 13, 1995, abandoned, and a continuation-in-part of application No. 08/522,109, Aug. 31, 1995, abandoned.

[30] **Foreign Application Priority Data**

Aug. 24, 1995 [EP] European Pat. Off. .... 95810531

[51] **Int. Cl.<sup>6</sup>** ..... **B67D 5/56**[52] **U.S. Cl.** ..... **222/145.6; 222/145.5; 222/567; 285/915**[58] **Field of Search** ..... **222/145.5, 145.6, 222/567, 326, 327, 136, 137; 285/360, 361, 376, 401, 396, 400, 402, 915**[56] **References Cited****U.S. PATENT DOCUMENTS**

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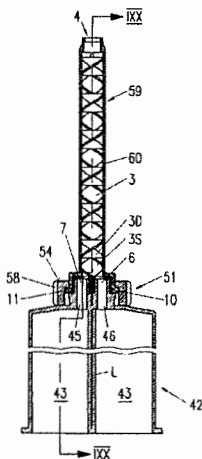
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*Attorney, Agent, or Firm*—Foley & Lardner

[57] **ABSTRACT**

The bayonet attachment on the cartridge for attaching a mixer or accessory to a multiple component cartridge is formed as a ring-shaped bayonet socket with two internal recesses and two diametrically opposed cutouts forming one bayonet coupling part means, whereas the bayonet attachment of the mixer or accessory comprises two bayonet lugs corresponding to the cutouts. In a preferred embodiment the lugs and cutouts are of different widths for the coded alignment of the mixer or accessory to the cartridge in one predetermined position only.

**44 Claims, 29 Drawing Sheets**

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Page 2

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FIG. 1

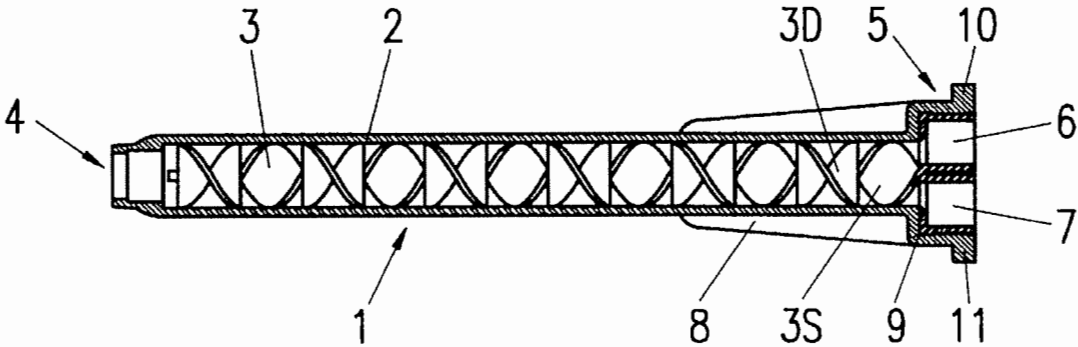
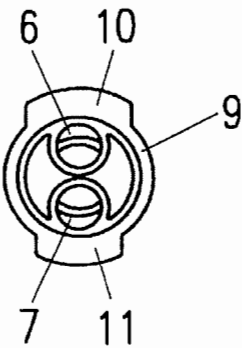


FIG. 2



U.S. Patent

Jul. 6, 1999

Sheet 2 of 29

5,918,772

FIG. 3

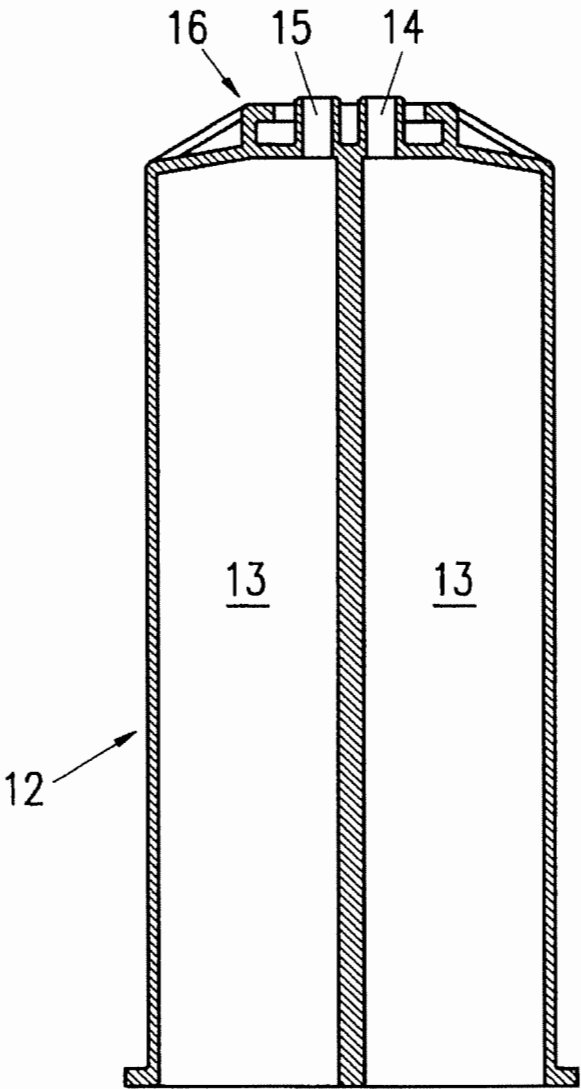
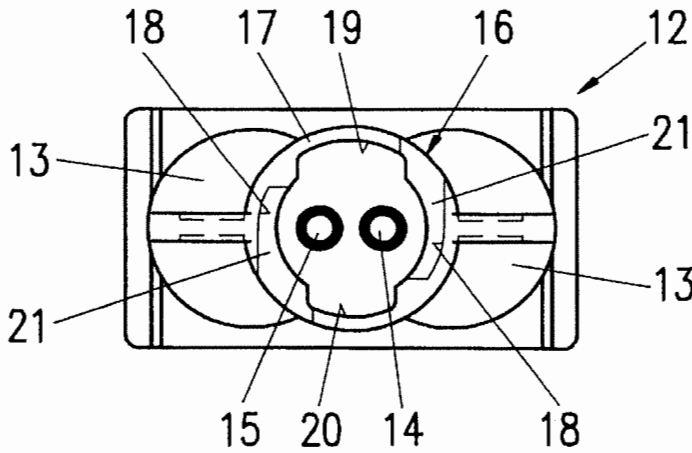


FIG. 4



U.S. Patent

Jul. 6, 1999

Sheet 3 of 29

5,918,772

FIG. 5

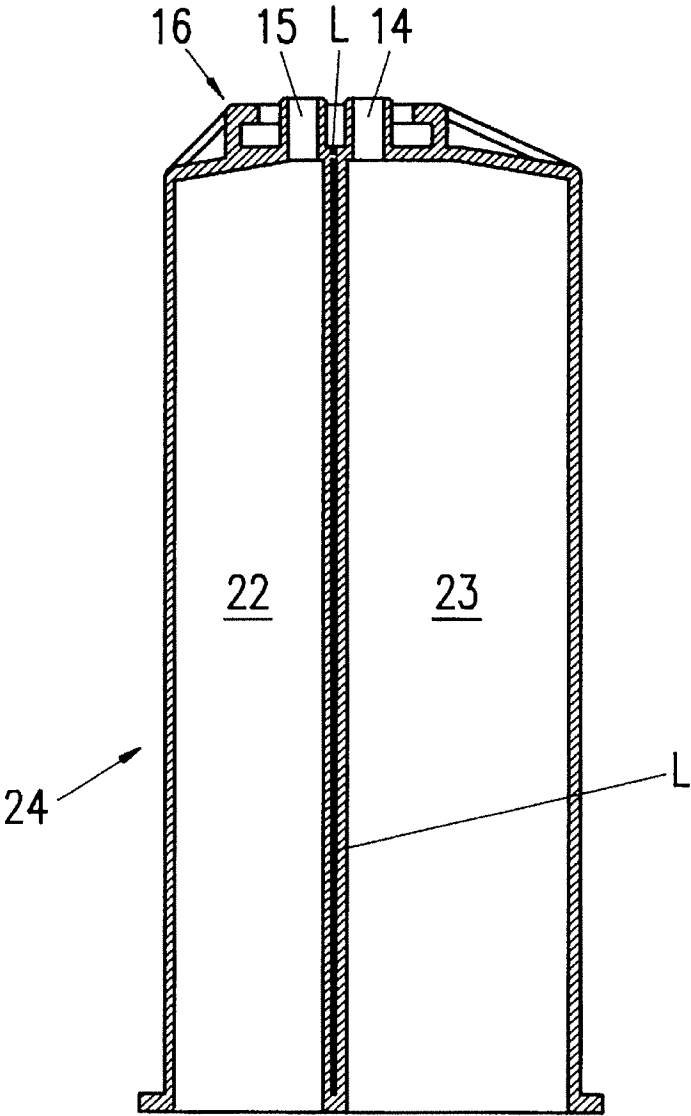


FIG. 6

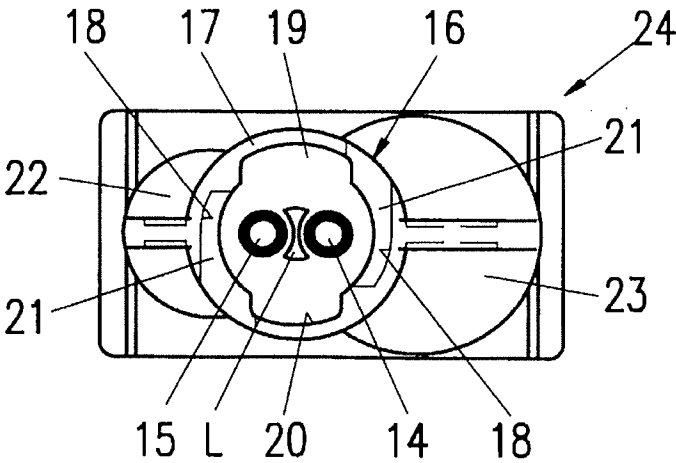


FIG. 7

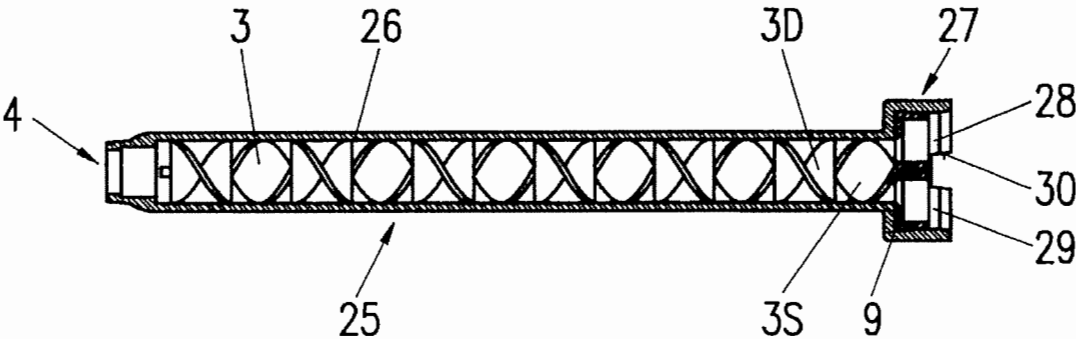
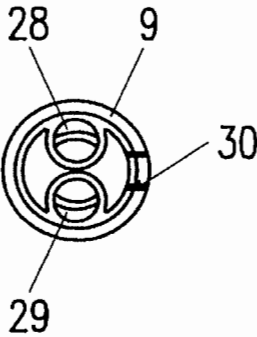


FIG. 8



U.S. Patent

Jul. 6, 1999

Sheet 5 of 29

5,918,772

FIG. 9

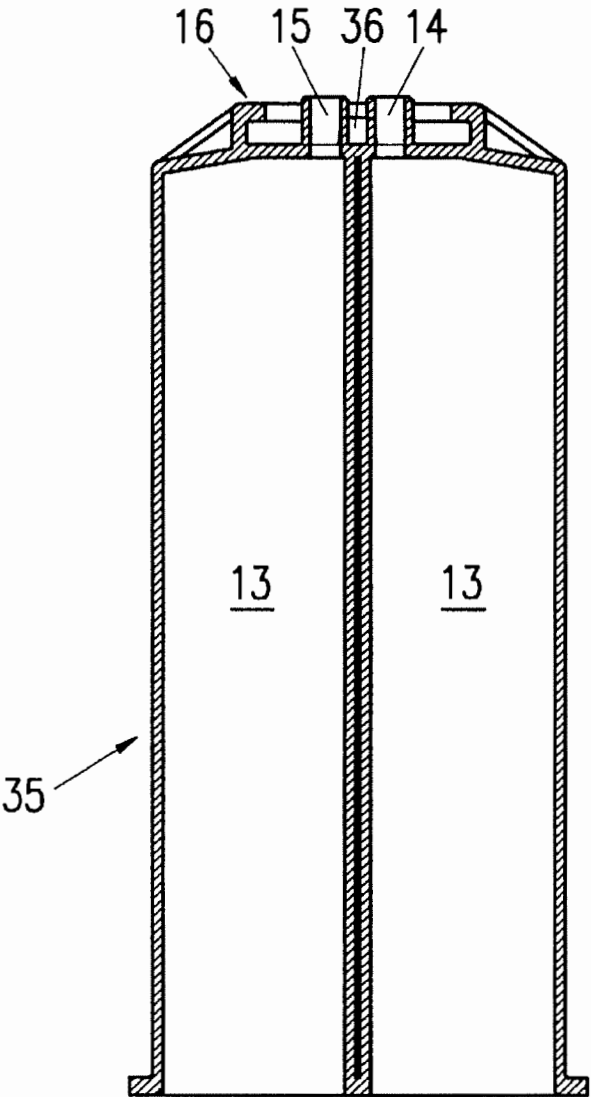


FIG. 10

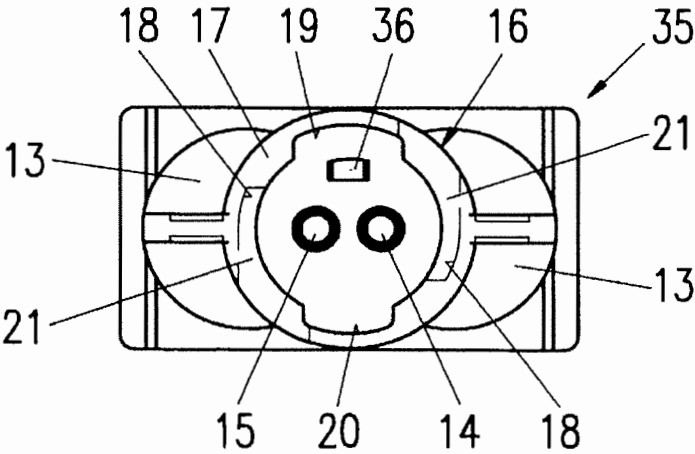


FIG. 11

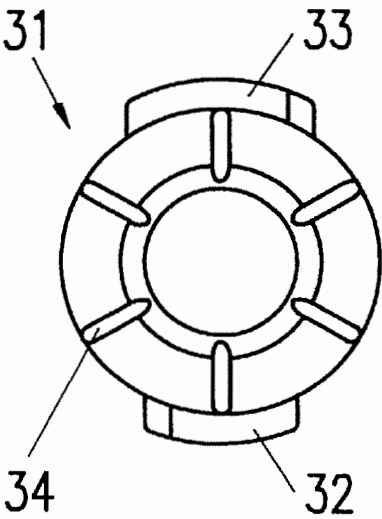


FIG. 12

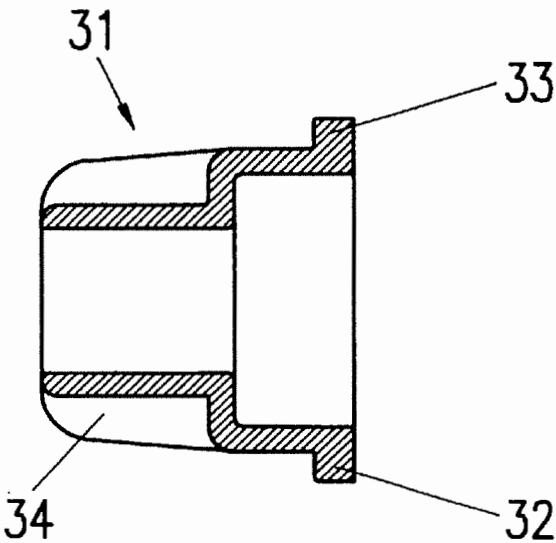




FIG. 13

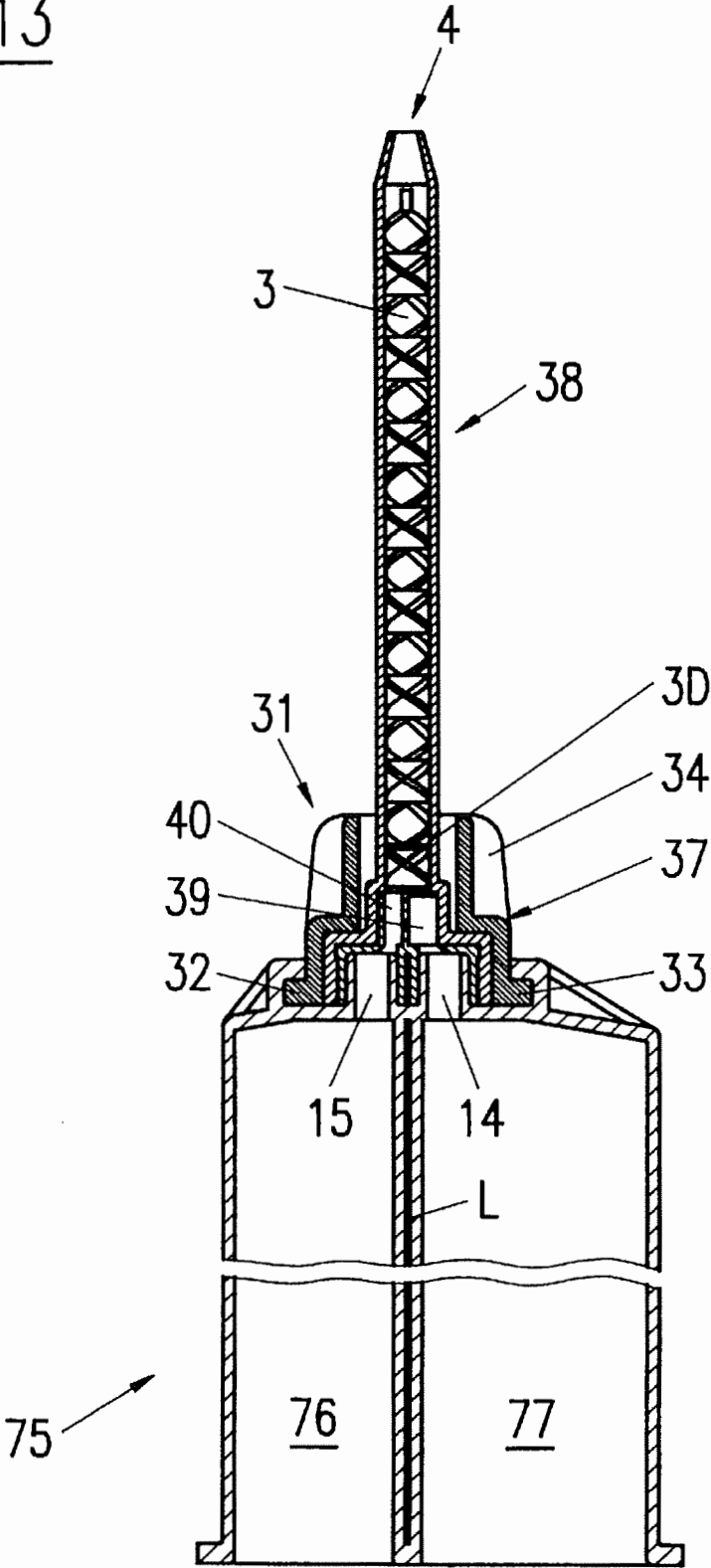


FIG. 14

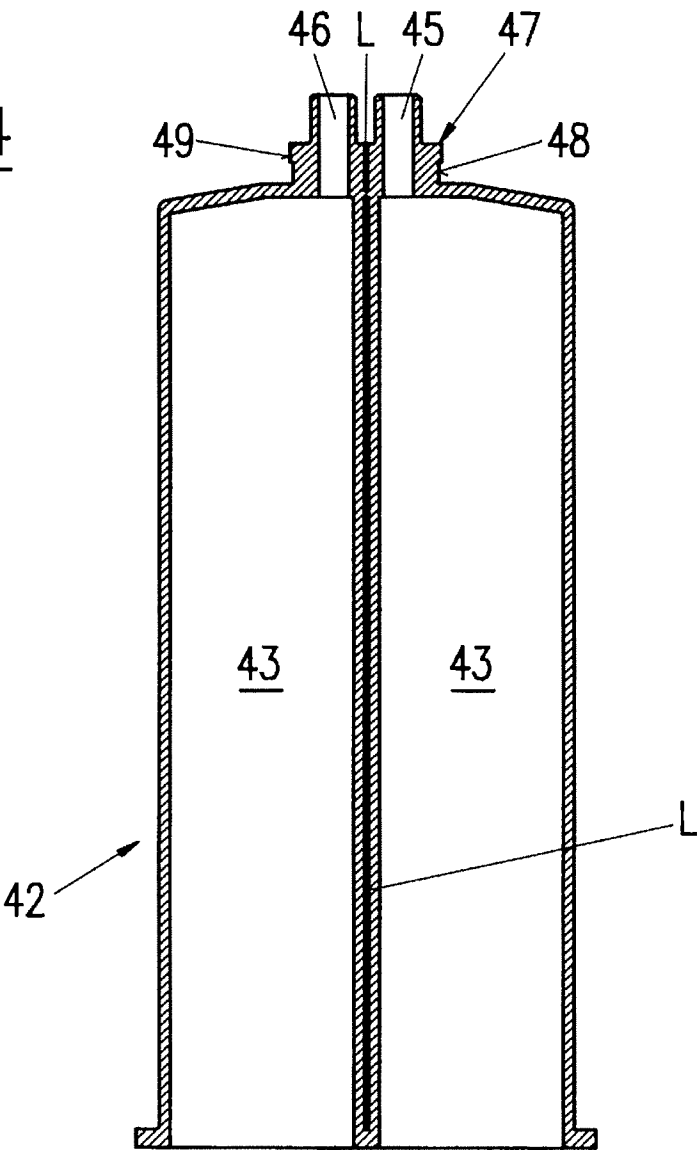


FIG. 15

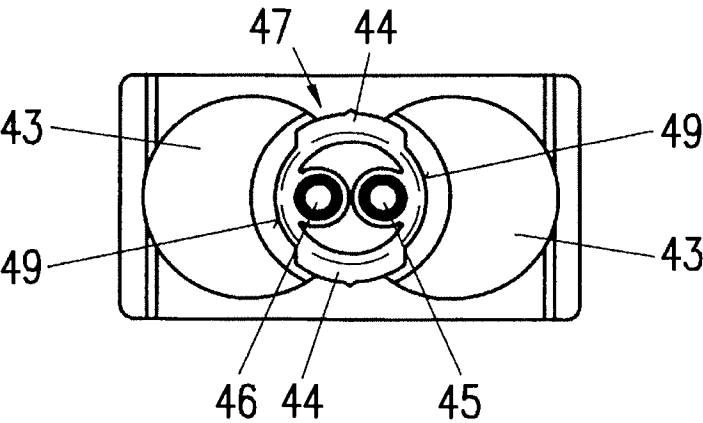


FIG. 16A

FIG. 16B

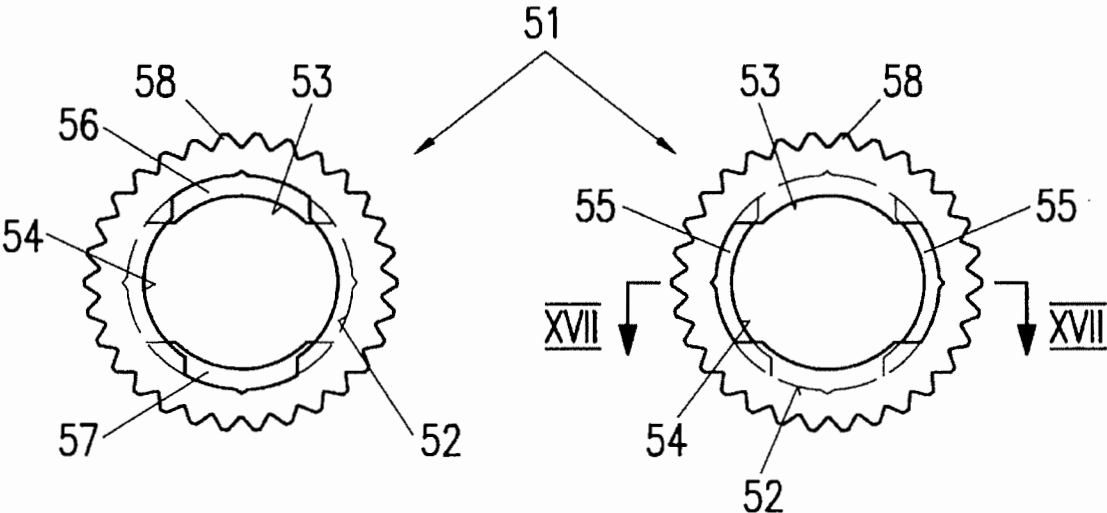


FIG. 17

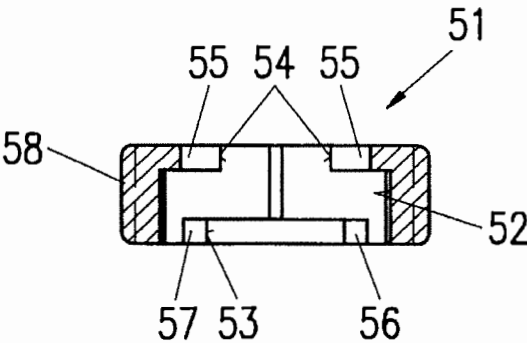


FIG. 18

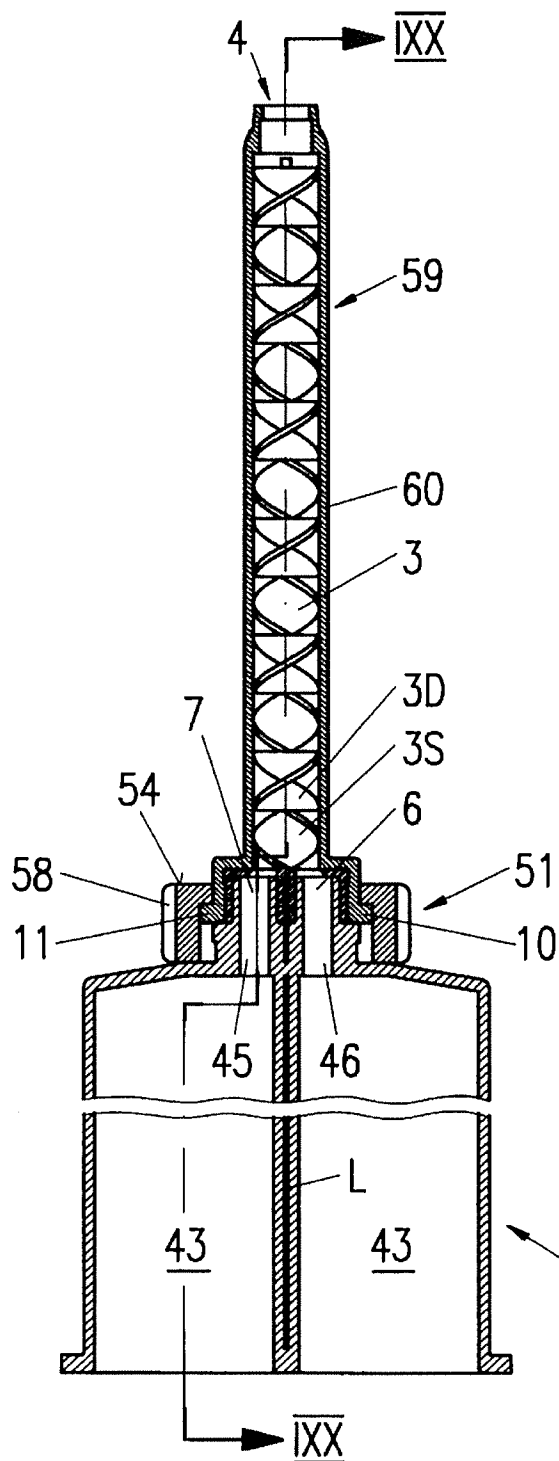


FIG. 19

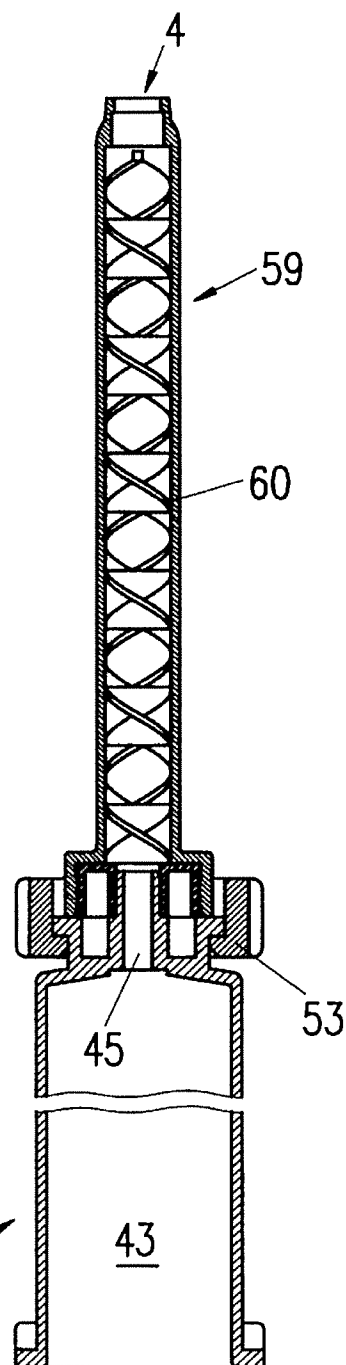


FIG. 20

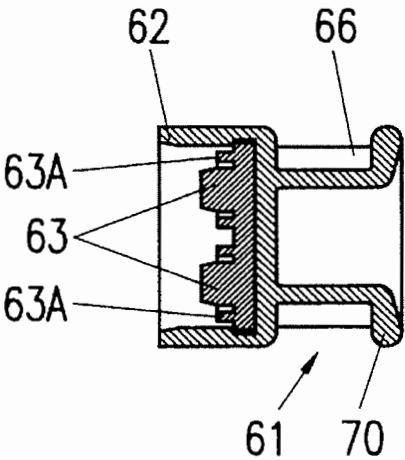


FIG. 21

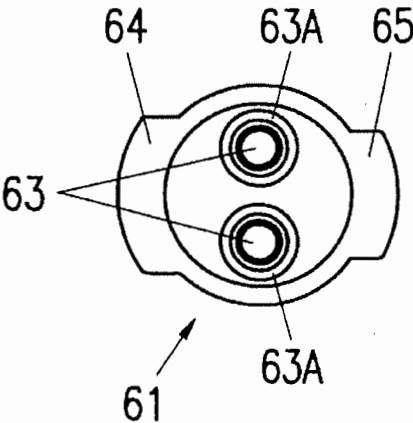


FIG. 22

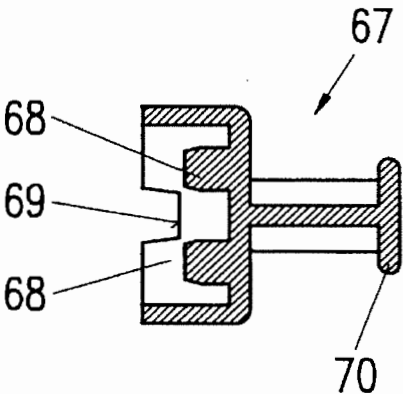


FIG. 23

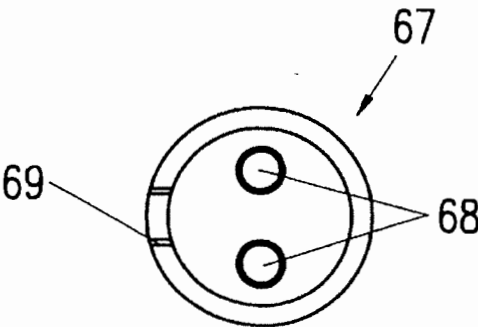


FIG. 24

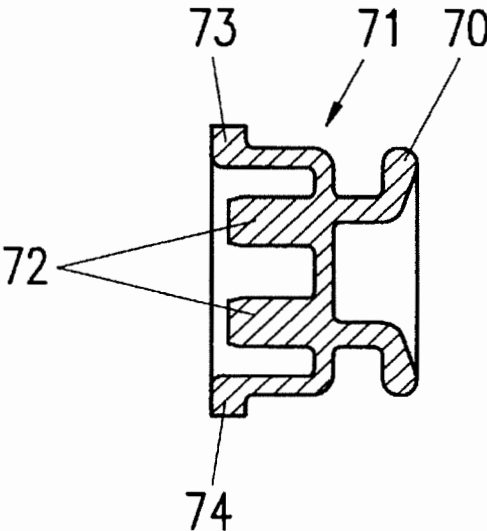


FIG. 25

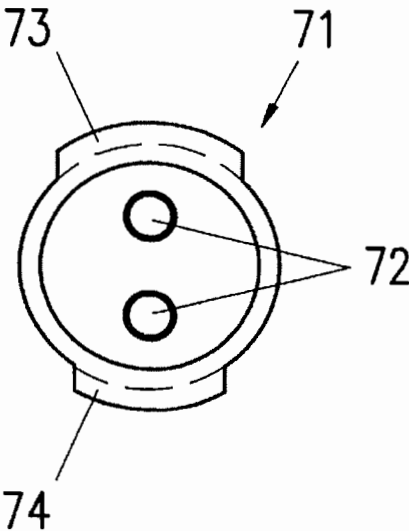




FIG. 27

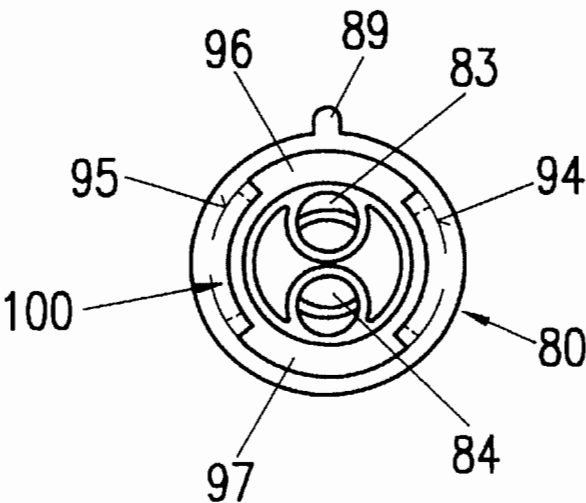
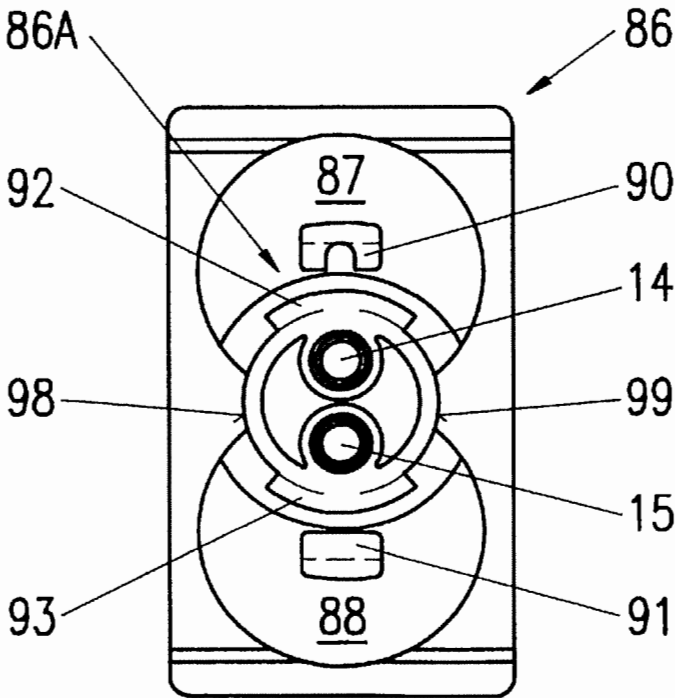


FIG. 28





U.S. Patent

Jul. 6, 1999

Sheet 15 of 29

5,918,772

FIG. 29

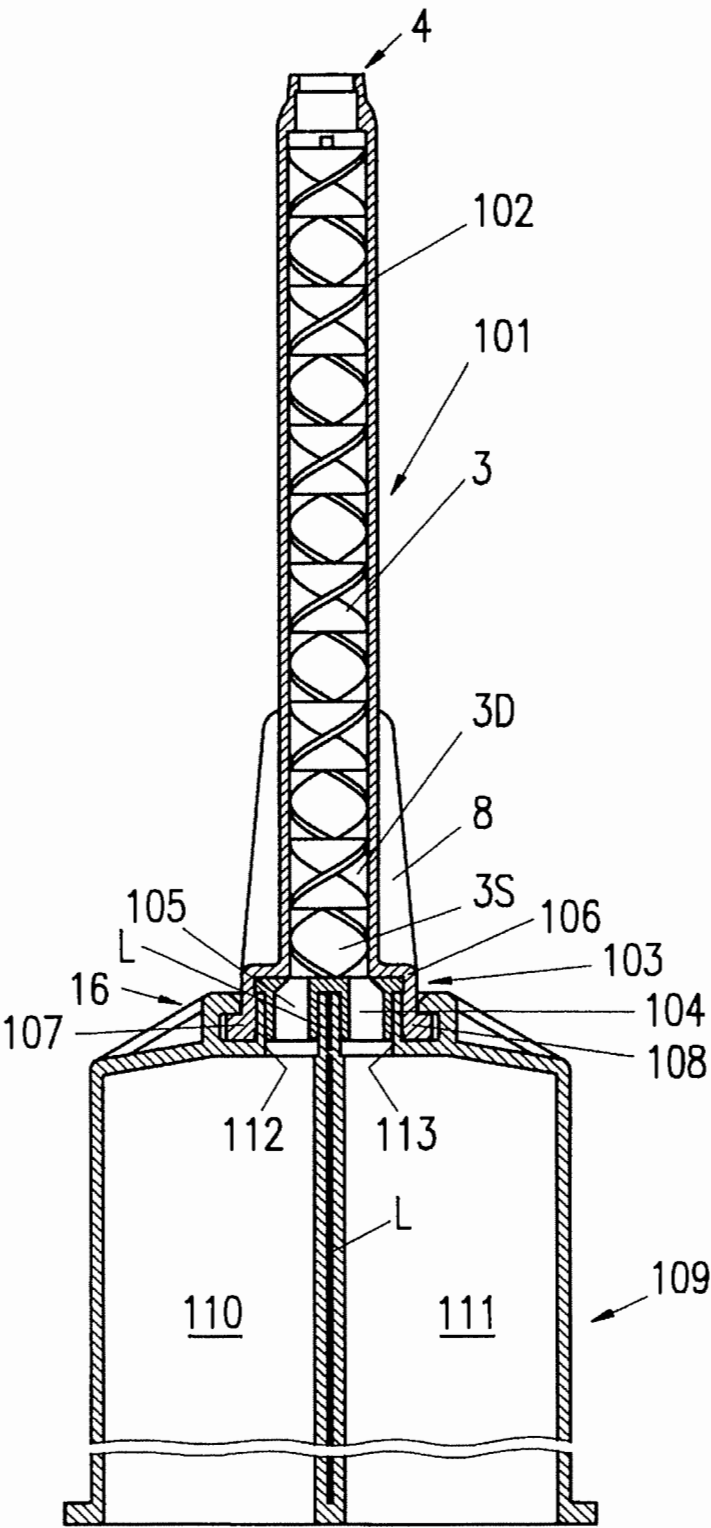


FIG. 30

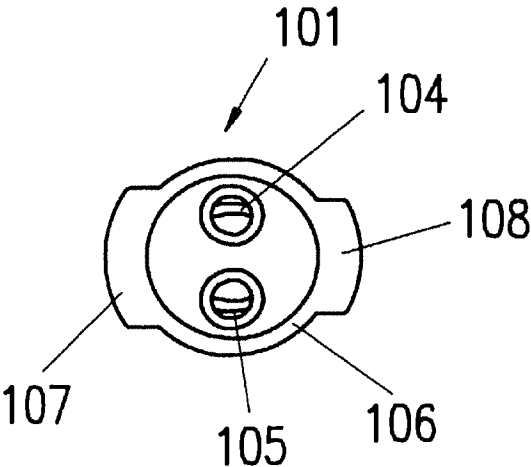


FIG. 31

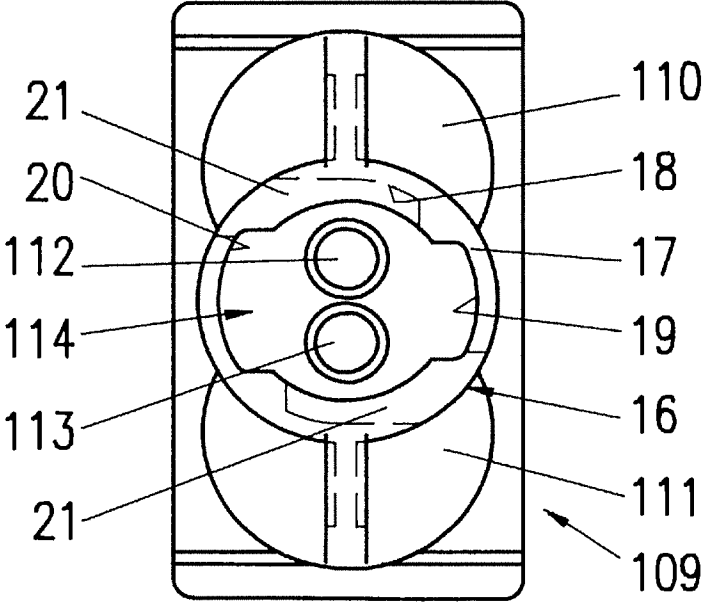


FIG.32

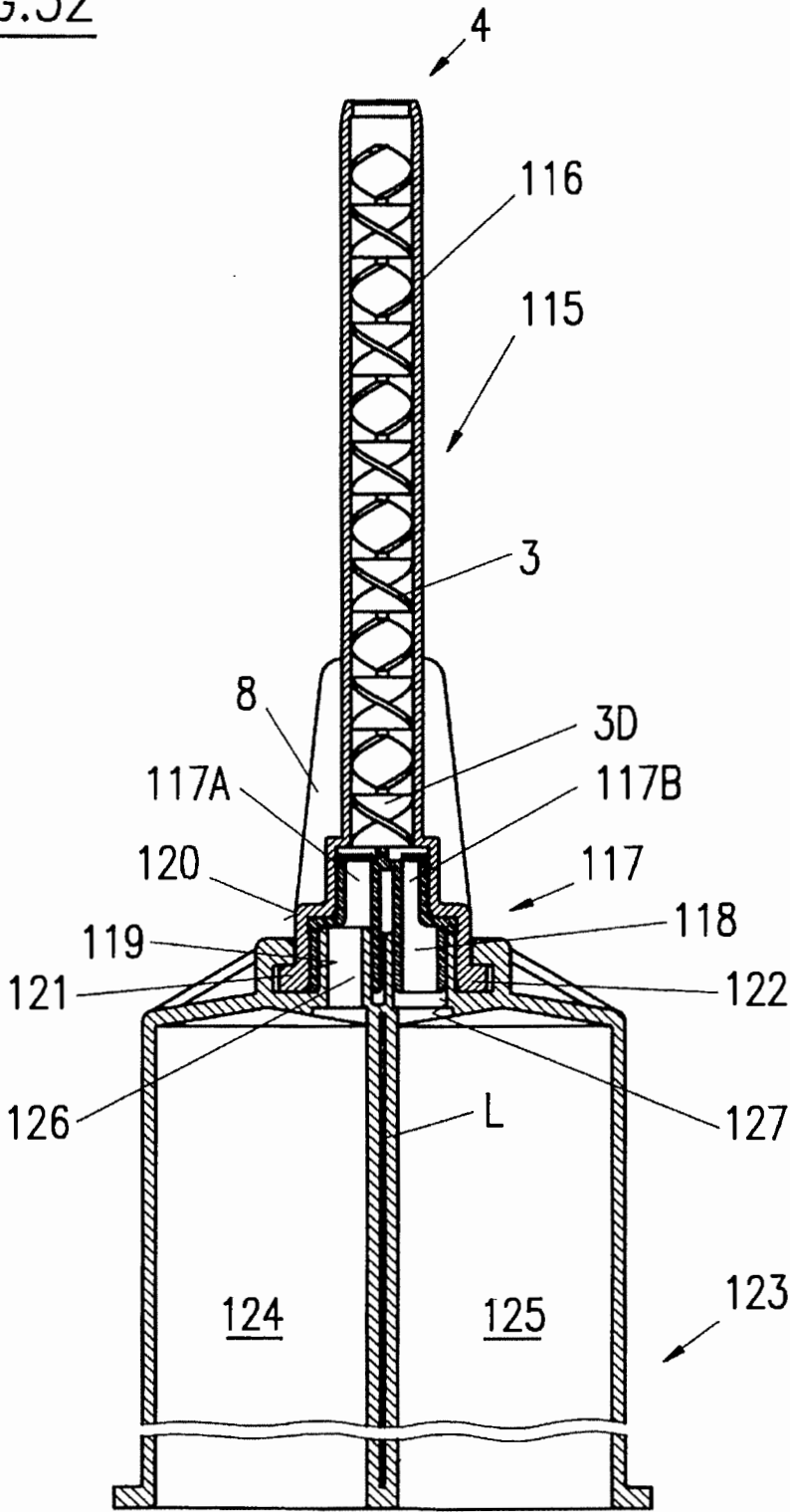


FIG. 33

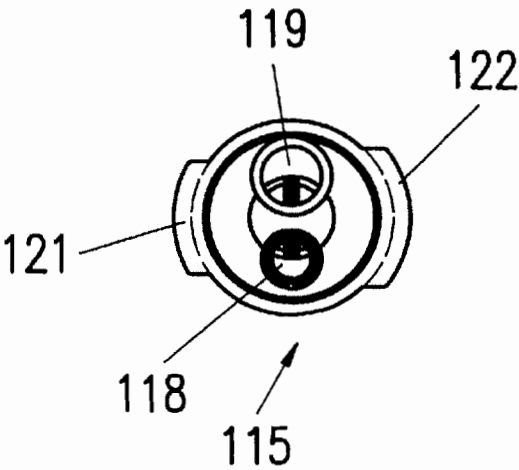


FIG. 34

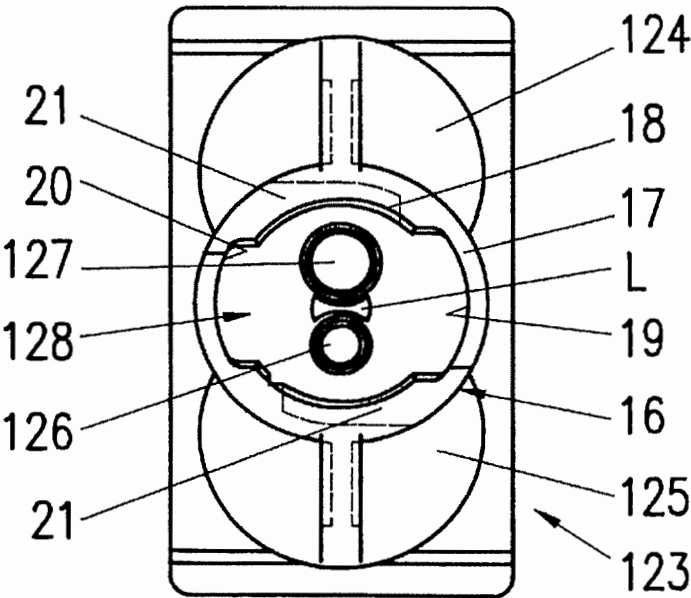




FIG. 36

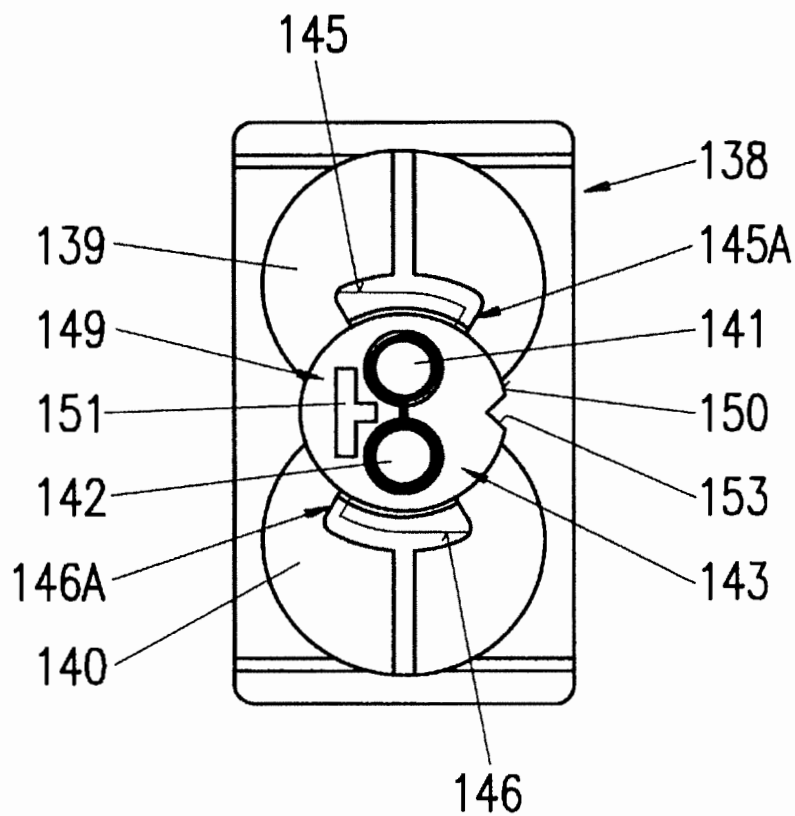


FIG. 37

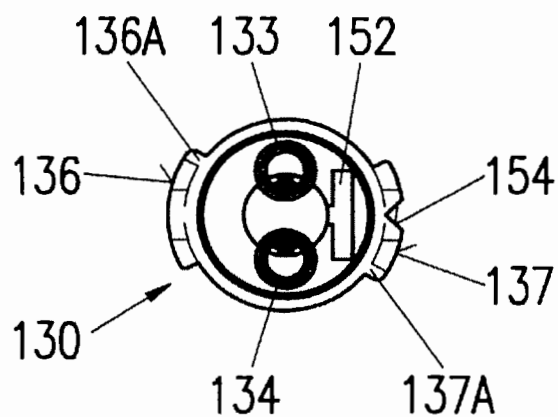
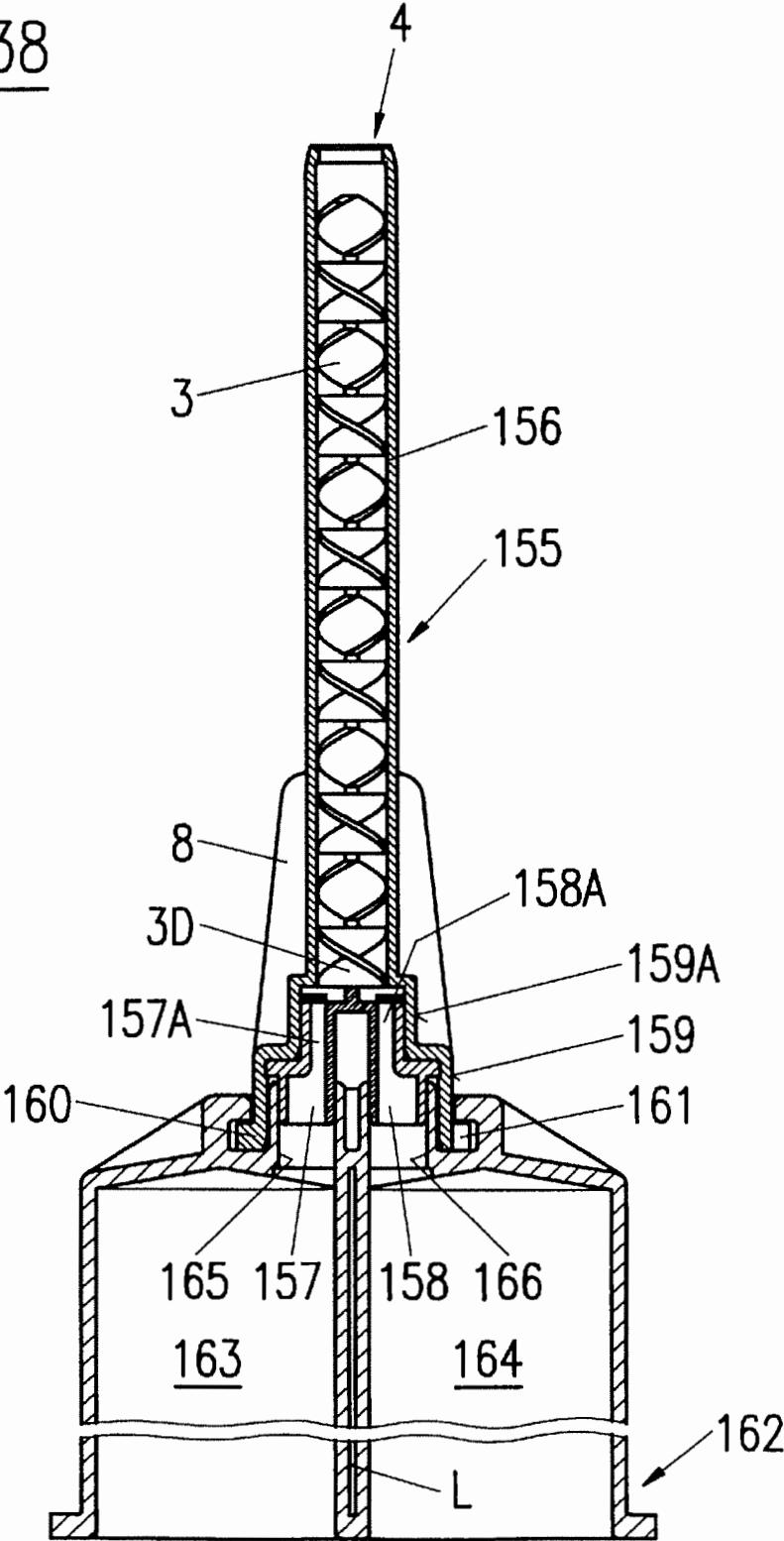


FIG. 38



U.S. Patent

Jul. 6, 1999

Sheet 22 of 29

5,918,772

FIG. 39

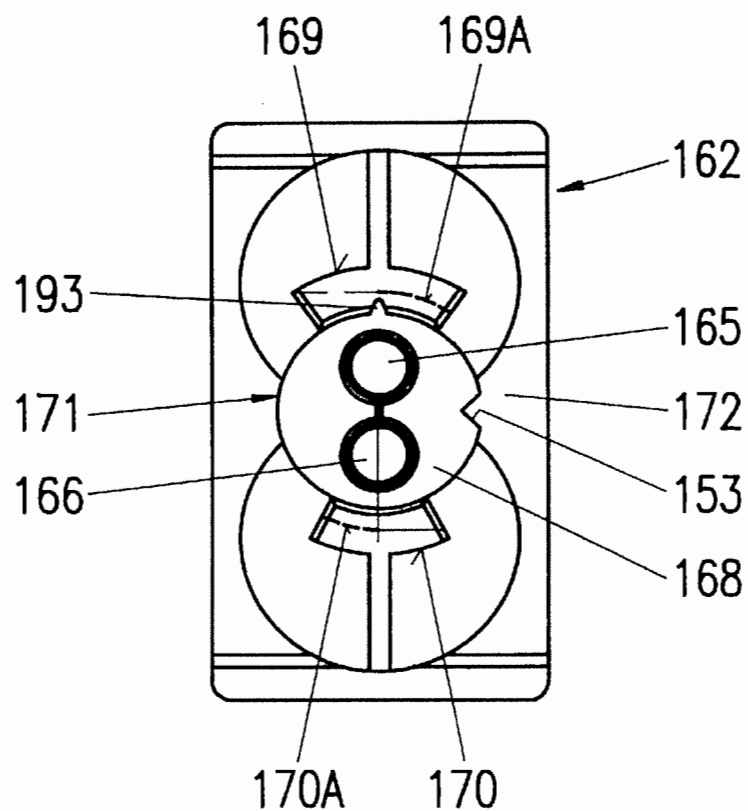


FIG. 40

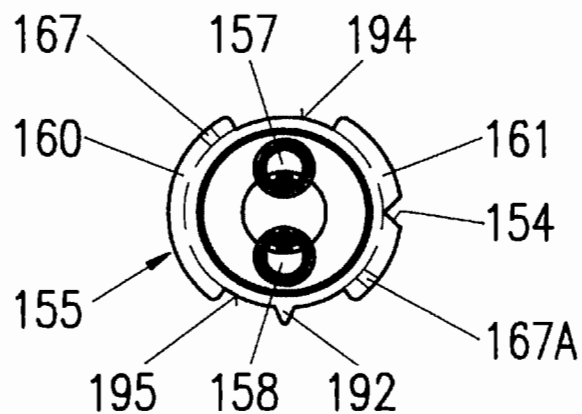




FIG. 41

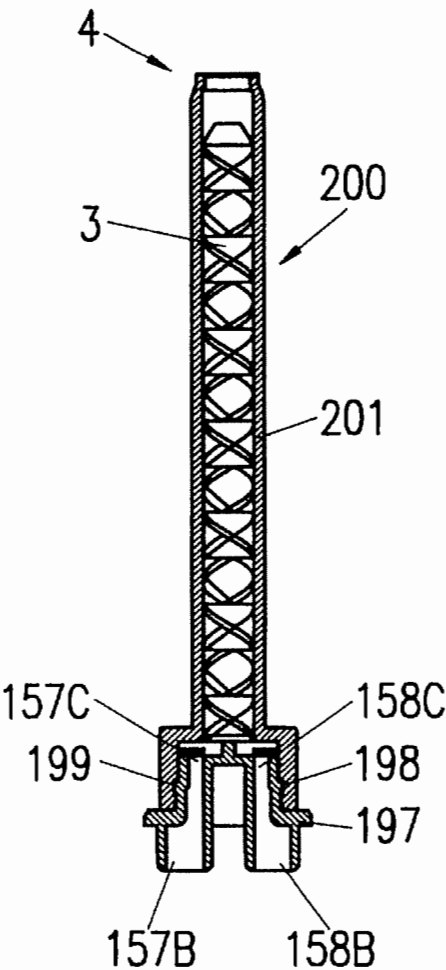


FIG. 42

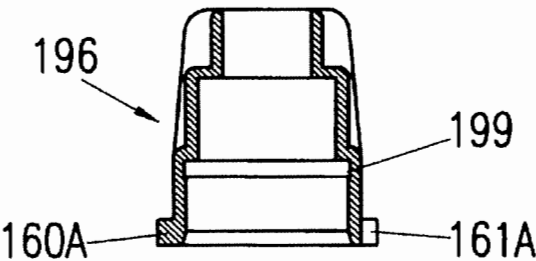
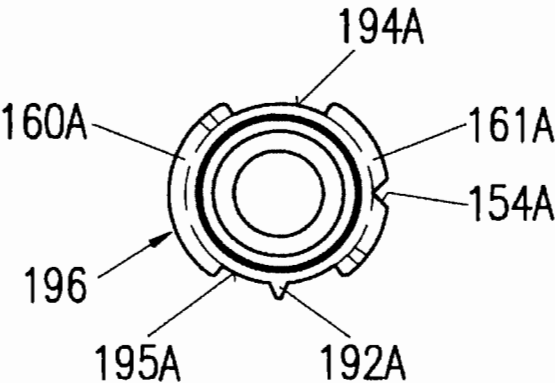


FIG. 43



U.S. Patent

Jul. 6, 1999

Sheet 24 of 29

5,918,772

FIG. 44

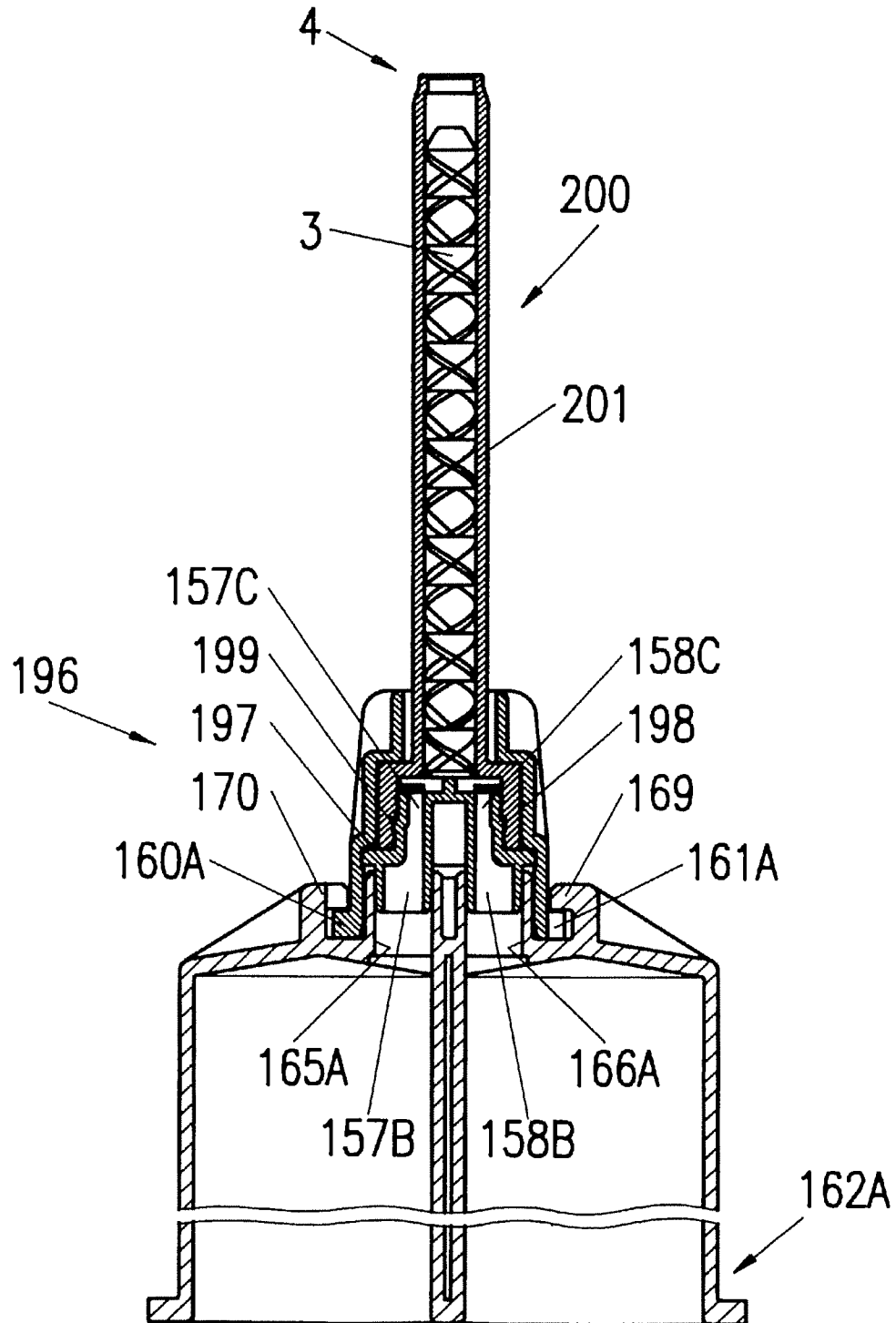


FIG. 45

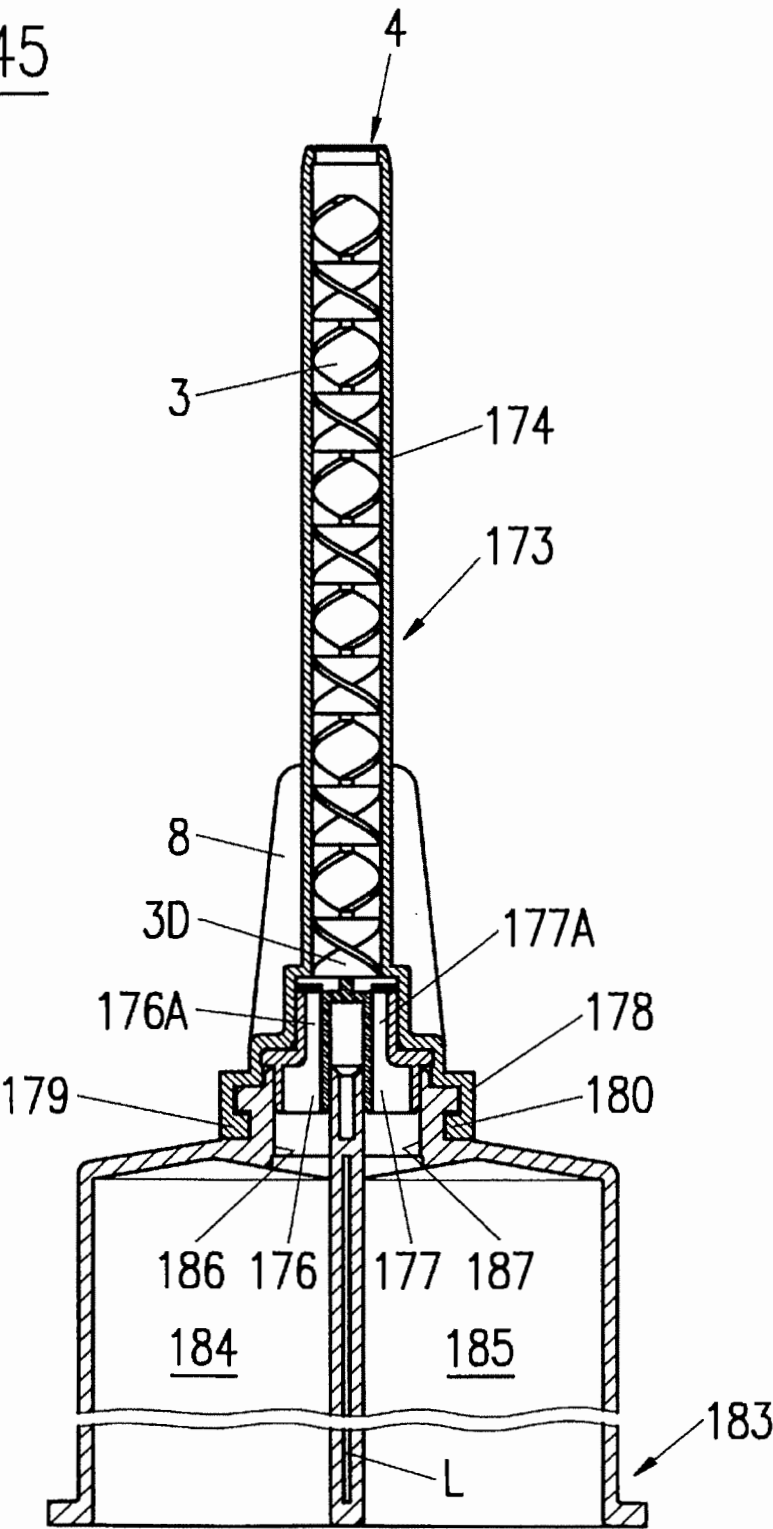


FIG. 46

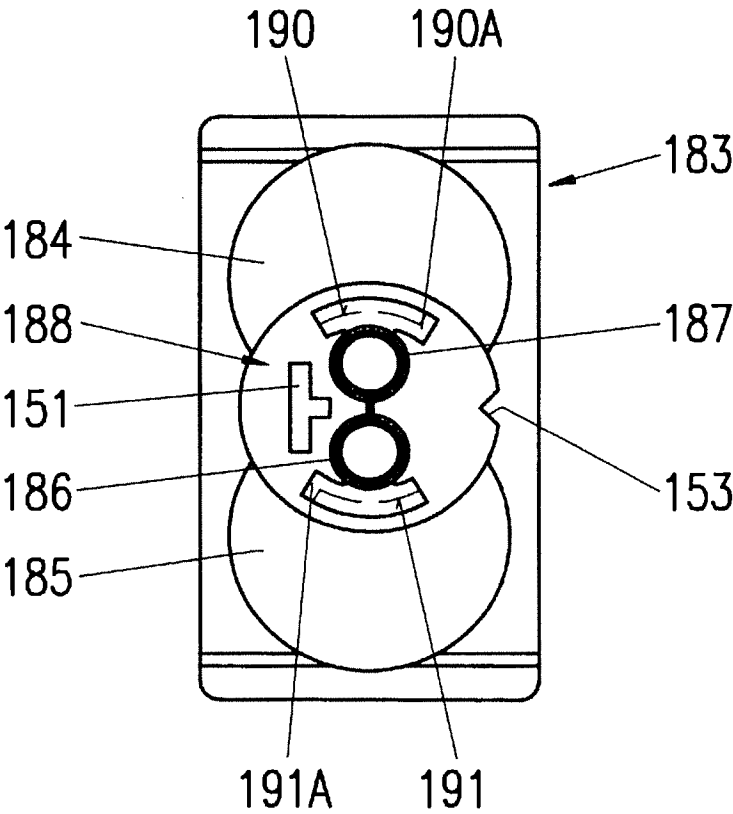


FIG. 47

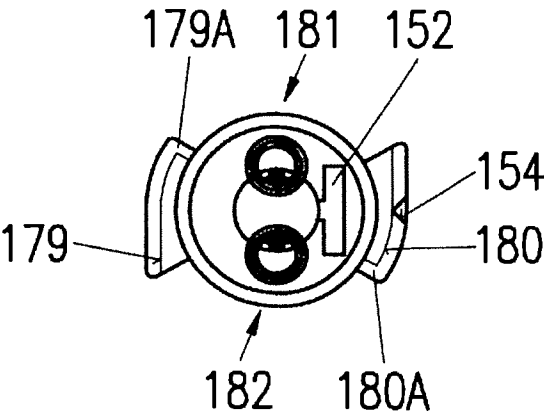


FIG. 48

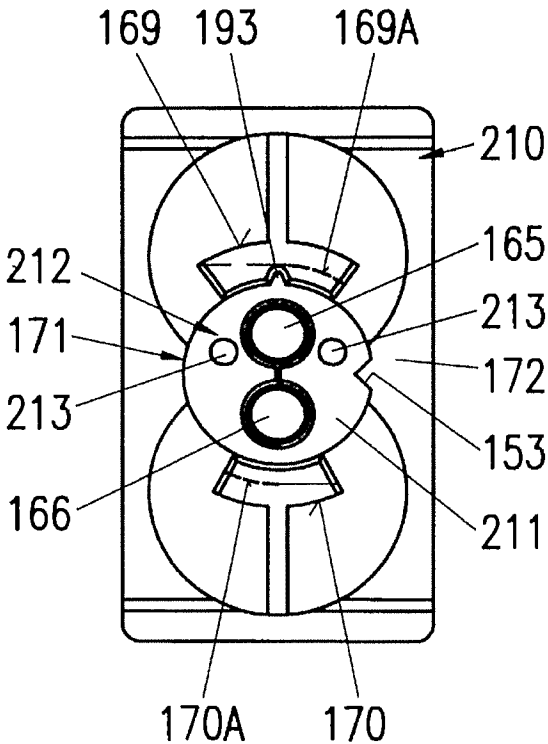


FIG. 50

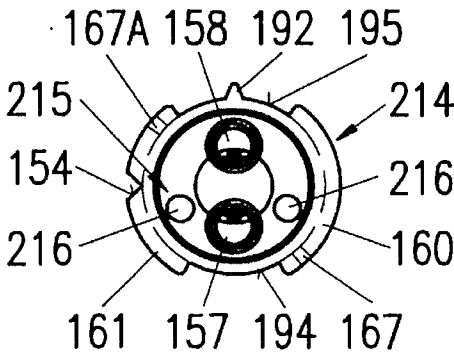


FIG. 49

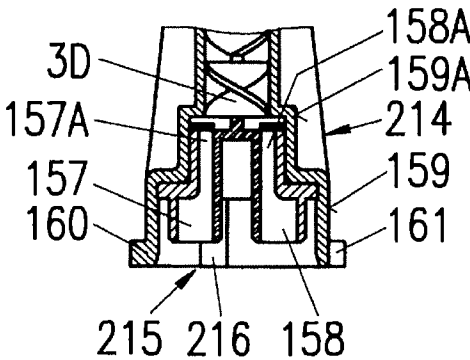


FIG. 51

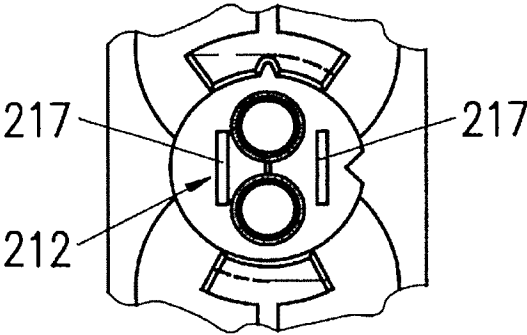


FIG. 52

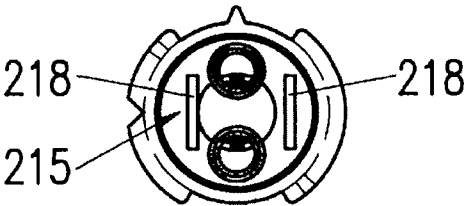


FIG. 53

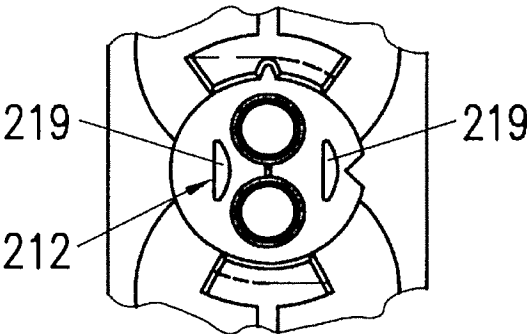


FIG. 54

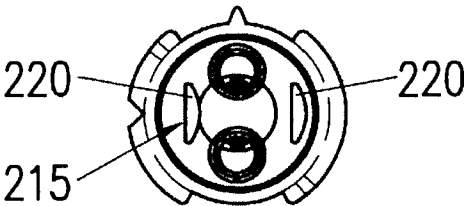


FIG. 55

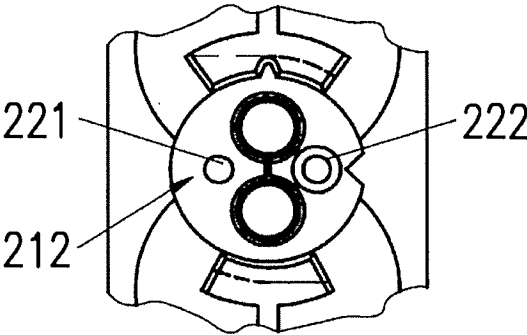


FIG. 56

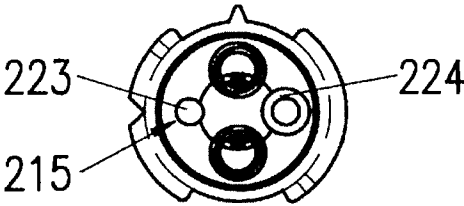


FIG. 57

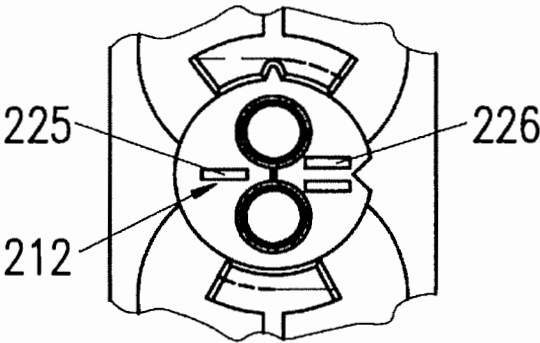
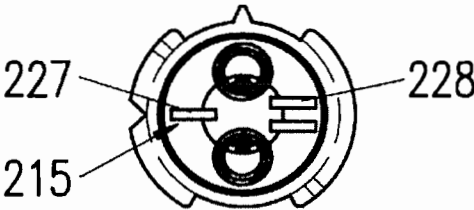


FIG. 58



5,918,772

1

# **BAYONET FASTENING DEVICE FOR THE ATTACHMENT OF AN ACCESSORY TO A MULTIPLE COMPONENT CARTRIDGE OR DISPENSING DEVICE**

## **CROSS-REFERENCE**

The present application is a continuation in part of patent application Ser. No. 08/403,172 filed Mar. 13, 1995, now abandoned, and of the continuation in part of patent application Ser. No. 08/522,109, filed Aug. 31, 1995 now abandoned.

## **BACKGROUND OF THE INVENTION**

The present invention relates to a bayonet fastening device for the attachment of an accessory to a dispensing device, in particular for the attachment of a mixer to a two-component cartridge.

There exists a great number of mixers and cartridges having means for attaching the mixer to the cartridge, e.g., according to U.S. Pat. No. 4,767,026 or U.S. Pat. No. 4,538,920 where the mixer has two bayonet locking lugs inserted into corresponding prongs on the cartridge by rotation. On one hand, the rotary locking movement of the complete mixer will cause contamination of one chemical component against the other chemical component at the interface between the cartridge and the mixer, in that these components will be transported from one outlet to the other outlet, from one inlet to the other inlet, causing an undesired reaction between these chemical components at the interface between cartridge and mixer or closure means, and eventually carrying such a reaction back into the cartridge outlets, thus causing plugging of the outlets. On the other hand there exist situations where it is necessary to connect and attach the mixer or accessory to a multiple component cartridge or dispensing device in a predetermined position, such as when cartridge outlets or mixer inlets are of a different size for different relative mixing ratios or when mixers or accessories are refitted for reuse.

There exists a need to connect and attach a mixer or accessory to a multiple component cartridge or dispensing device in a predetermined orientation, such as when cartridge outlets or mixer inlets are of a different size for different relative mixing ratios or when special high ratio mixers are used for greater mixing efficiency and when mixers or accessories are refitted for reuse. In the latter case of reuse, it is necessary to avoid any possibility of cross contamination of one chemical component against another during refitting. Such cross contamination of reactive chemical systems can cause plugging at the cartridge outlets and cause a reaction back into and within the cartridge.

U.S. Pat. No. 5,228,599 discloses a multiple dispensing cartridge having a mixer attached thereto with the aid of a coupling nut having an internal thread, wherein each storage cylinder ends in a dispensing opening which forms a side by side outlet, whereas the inlet of the mixer is not defined. The mixer is put on the cartridge and secured by a coupling nut via an external thread at the cartridge.

Another cross contamination situation can occur when a clean mixer or accessory inlet area or closure plugs are able to make any form of incorrect alignment contact, such as by angular tipping, with the chemical components at the cartridge outlet area during the process of initial placing of the mixer or closure plugs against the cartridge in preparation for attachment. In that case, when fitting the same mixer or closure plugs in the correct position, it is possible to now chemically contaminate the outlets of the cartridge. Again, this can cause plugging and a reaction back into and within the cartridge.

2

Finally, all bayonet attachment means of the prior art have, in common, that the bayonet prongs of the cartridge are relatively small and therefore of limited structural rigidity and strength. This allows the possibility of distortion and is of greater significance due to the trend towards smaller mixer diameters and therefore high backpressures, the result being leakage at the mixer to cartridge sealing interface during dispensing.

## **SUMMARY OF THE INVENTION**

On the basis of this prior art, it is an object of the present invention to provide for a bayonet attachment device for attaching a mixer, or closure means or any other accessory, such as an adapter or a connecting tube to a multiple component dispensing device, in particular a two component cartridge, which has improved strength and structural rigidity against stress caused by greater hydraulic forces due to the trend towards smaller mixer diameters as well as providing improved interface sealing.

This object is attained with a device wherein said bayonet attachment means at the dispensing apparatus or cartridge is formed as ring-shaped bayonet socket, with at least two internal recesses or an inner circular groove with at least two bayonet cutout followed by adjacent bayonet retaining means, and wherein the bayonet attachment means of the accessory comprises at least two bayonet lugs corresponding to the cut outs.

It is another object of the invention that alignment of the accessory inlets to the cartridge outlets takes place in one position only to avoid cross contamination. This object is attained with a device wherein said bayonet attachment means at the dispensing apparatus or cartridge and at the accessory have means for coded alignment of the accessory to the dispensing apparatus or cartridge.

Other objects and improvements of the device are defined in the dependent claims.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will be explained in more detail hereinafter with reference to a drawing of embodiments.

FIGS. 1-6 show a first embodiment of the invention with a rotatable mixer housing, wherein

FIG. 1 is a longitudinal section of a mixer,

FIG. 2 is a view of the inlet end of the mixer,

FIG. 3 is a longitudinal section of a cartridge,

FIG. 4 is a top view of the cartridge of FIG. 3 with distanced outlets and ring-shaped bayonet means,

FIG. 5 is a longitudinal section of a cartridge having two containers with different cross-sectional areas,

FIG. 6 is a top view of the cartridge of FIG. 5 with distanced outlets and ring-shaped bayonet means.

FIGS. 7-13 show a second embodiment of the invention comprising a coupling ring, wherein

FIG. 7 is a longitudinal section of a mixer,

FIG. 8 is a view of the inlet end of the mixer,

FIG. 9 is a longitudinal section of a cartridge with distanced outlets and ring-shaped bayonet means,

FIG. 10 is a top view of the cartridge of FIG. 9 with a nose piece,

FIG. 11 is a top view of a coupling ring,

FIG. 12 is a section of the coupling ring of FIG. 11,

FIG. 13 is a longitudinal section of a variant of the mixer of FIG. 7 and 8 attached to the cartridge of FIGS. 5 and 6 having containers with different cross-sectional areas.

FIGS. 14-19 show a third embodiment of the invention with a locking ring permanently attached to the cartridge, wherein



5,918,772

3

FIG. 14 is a longitudinal section of a cartridge with distanced outlets,

FIG. 15 is a top view of the cartridge of FIG. 14,

FIG. 16A is a view on the mixer side of a locking ring to be attached to the cartridge,

FIG. 16B is a view on the cartridge side of the locking ring of FIG. 16A,

FIG. 17 is a section of the locking ring according to the line XVII—XVII of FIG. 16B,

FIGS. 18 and 19 show in two longitudinal sections at 90° to each other a mixer attached to the cartridge of FIG. 14 with the locking ring of FIGS. 16A–17, in the locked position.

FIGS. 20–25 show three embodiments of a closure cap for the cartridge, wherein

FIGS. 20–21 show as first embodiment a two part closure cap in a longitudinal section and a view on its cartridge side face,

FIGS. 22–23 show as second embodiment a one part closure cap for use with a coupling ring in a longitudinal section and a view on its cartridge side face.

FIGS. 24–25 show as third embodiment a one part closure cap for use with a locking ring attached to the cartridge in a longitudinal section and a view on its cartridge side face. FIGS. 26–28 show an alternative embodiment of the invention with a ring-shaped bayonet socket at the rotatable mixer housing, wherein

FIG. 26 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 27 is a view of the inlet end of the mixer, and

FIG. 28 is a top view of the cartridge of FIG. 26.

FIGS. 29–31 show a further embodiment of the invention with a ring-shaped bayonet socket at the cartridge, wherein

FIG. 29 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 30 is a view of the inlet end of the mixer, and

FIG. 31 is a top view of the cartridge of FIG. 29.

FIGS. 32–34 show a further embodiment of the invention with a ring-shaped bayonet socket at the cartridge, wherein

FIG. 32 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 33 is a view of the inlet end of the mixer, and

FIG. 34 is a top view of the cartridge of FIG. 32,

FIGS. 35–37 show a further embodiment of the invention with a sector-shaped bayonet socket at the cartridge, wherein

FIG. 35 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 36 is a top view of the cartridge of FIG. 35, and

FIG. 37 is a view of the inlet end of the mixer.

FIGS. 38–40 show an alternative embodiment of the invention with a sector-shaped bayonet socket at the cartridge, wherein

FIG. 38 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 39 is a top view of the cartridge of FIG. 38, and

FIG. 40 is a view of the inlet end of the mixer.

FIGS. 41–44 show a further embodiment of the invention with a coupling ring, wherein

FIG. 41 is a longitudinal section of a mixer,

FIG. 42 is a longitudinal section of a coupling ring,

FIG. 43 is a top view of the coupling ring of FIG. 42, and

FIG. 44 is a longitudinal section of the mixer attached to a partially shown cartridge via the coupling ring.

FIGS. 45–47 show a further embodiment of the invention with a sector-shaped bayonet socket at the mixer, wherein

FIG. 45 is a longitudinal section of a mixer attached to a partially shown cartridge,

4

FIG. 46 is a top view of the cartridge of FIG. 41, and FIG. 47 is a view of the inlet end of the mixer.

FIGS. 48–58 show several further coding means at both the cartridge and the mixer for preventing cross-contamination by erroneous attachment of the mixer onto the cartridge, wherein

FIG. 48 is a top view of a cartridge like in FIG. 39, with additional coding means,

FIG. 49 is a section of the inlet end of a mixer like in FIG. 38, with additional coding means,

FIG. 50 is a view of the inlet end of the mixer of FIG. 49. FIGS. 51 and 52 show a variant of the coding means at the cartridge and mixer.

FIGS. 53 and 54 show a further variant of the coding means at the cartridge and mixer.

FIGS. 55 and 56 show a further variant of the coding means at the cartridge and mixer.

FIGS. 57 and 58 show a further variant of the coding means at the cartridge and mixer.

#### DETAILED DESCRIPTION OF THE INVENTION

FIGS. 1–2 show a mixer 1 comprising a mixer housing 2, a mixer element group 3, the mixer outlet 4 and a mixer inlet section 5 with two separated inlet parts 6 and 7, which are integral with a properly aligned separating element 3S of the mixer element group 3. This mixer is attached to the cartridge by matching the mixer different width bayonet lugs 10, 11 to the different width bayonet sockets 19, 20 while pressing the mixer onto the cartridge and by rotating the mixer housing 2. The separated inlet parts 6 and 7 and the mixer element group 3 with the separating element 3S do not rotate. Separating element 3S serving in this embodiment as a separating means for guiding each chemical component separately to the first dividing element 3D of the mixer element group 3.

The mixer housing is provided with longitudinal ribs 8 that end at the larger diameter 9 of the mixer housing 2. The two lateral ends of the ribs are formed as bayonet lugs 10 and 11 cooperating with the bayonet retaining means of the cartridge. As follows from FIG. 2, the two lugs do not have the same width, lug 10 being larger than lug 11. As will be shown later, the different width of the lugs enable a coded alignment and attachment of the mixer to the cartridge.

The mixer element group 3 is connected to the separated inlet parts 6 and 7 and is disposed in such a way within the housing that the housing itself is rotatable around the mixer element group 3 with attached inlet parts 6 and 7, which are arranged at the inlet side of the first mixer element 3S serving in this embodiment as a separating means for guiding each component separately to the first dividing element 3D of the mixer element group 3.

In FIG. 3, the cartridge 12 comprises two cylindrical containers or chamber 13 of equal cross-sectional areas for a 1:1 metering ratio ending in two individual, separate cylindrical and distal outlets 14 and 15. The outside shapes of the distal outlets 14 and 15 of the cartridge correspond to the respective inside shapes of the separate inlets 6 and 7 of the mixer, (see FIG. 1), whereby the inlets of the mixer fit over the outlets of the cartridge for tightly sealed connections. A reverse arrangement, where the inlet parts 6 and 7 fit into the outlet openings 14 and 15 is also possible.

In FIG. 4, the bayonet means 16 at the cartridge comprises a ring-shaped bayonet socket 17 with two internal recesses 18 and a circular opening with two diametrically opposed different width bayonet cutouts 19 and 20 for receiving the

5,918,772

5

corresponding different width bayonet lugs 10 and 11, (see FIG. 1), of the mixer, allowing coded introduction of the mixer in one predetermined position only. The flange parts 21 adjacent to the cutouts serve as bayonet retaining means for securing the lugs of the mixer.

The ring-shaped bayonet means provides, in particular, for increased strength of the bayonet retaining means and increased structural rigidity of the outlet end of the cartridge when, during dispensing, the hydraulic forces transmitted from the attached mixer are at a maximum. This arrangement is a substantial improvement in comparison with the prior art bayonet prongs.

FIGS. 5 and 6 show a variant to the embodiment shown in FIGS. 1–4 in that the containers 22 and 23 of cartridge 24 have different cross-sectional areas for metering ratios other than 1:1.

In both described cases, in order to attach the mixer to the cartridge, the mixer can only be aligned with its bayonet lug widths corresponding to the different width cut outs of the bayonet sockets, then pressed onto the cartridge such that when the mixer is in place and the outlets and inlets are connected, the mixer housing 2 is rotated by 90° for the engagement of the bayonet lugs 10, 11 in the bayonet retaining means 21 of the cartridge. This attachment method prevents contamination of one component by the other at the mixer-cartridge interface yet enabling a quick coded attachment of the mixer.

FIGS. 7 and 8 show in a second embodiment a mixer 25 comprising a mixer housing 26, a mixer element group 3, a mixer outlet 4, and a mixer inlet section 27. This mixer is fixed to the cartridge (see FIG. 9) with the aid of a separate coupling ring (see FIGS. 11 and 12). The coupling ring 31 is provided with two bayonet lugs 32 and 33 corresponding to the bayonet cutouts 19, 20, respectively of the bayonet attachment means 16 at the cartridge. For better manual gripping, ribs 34 are provided on the outer cylindrical surface.

It follows in particular from FIG. 7 that the mixer inlet section 27 comprises two cylindrical, individual inlet openings 28, 29 at the inlet side face of the first mixer element 3S serving in this embodiment as a separating means for guiding each component separately to the first dividing element 3D of the mixer element group 3. A slot 30 provides for a coded alignment of the mixer in regard to a cartridge.

Cartridge 35 (see FIGS. 9 and 10) is the same as cartridge 1 of FIG. 1 with the exception that the bottom of the bayonet attachment means 16 comprises a nose piece 36 corresponding to the slot 30 at the mixer (see FIGS. 7 and 8) for coded alignment of the mixer.

When connecting the mixer to the cartridge, the nose piece 36 on the cartridge fits into slot 30 of the mixer inlet section 27. This coded connection method assures not only one alignment possibility but also axial mixer attachment without rotation of the mixer housing, thus preventing contamination of one component by the other at the cartridge/mixer interface.

There are other coding means possible at the dispensing apparatus or cartridge and at the accessory for the coded alignment of the accessory to the dispensing apparatus or cartridge, e.g. pins or protruding parts of all kind fitting into a recess or cavity or slot.

FIG. 13 shows a mixer 38 attached to a cartridge 75 having containers 76 and 77 with different cross-sectional areas, as a variant to the embodiment shown in FIGS. 5–12 in that the mixer inlet section 37 of mixer 38 has a separating means within the mixer, which separating means comprises

6

separated inlet chambers 39, 40, respectively having different cross-sectional areas, and lodged within a smaller combined diameter than the cartridge outlet with corresponding openings for each chamber for material to pass through.

The aforementioned separating means serves to maintain separation of the material flows up to the first dividing element 3D of the mixer element group 3. This separating means can have chambers with equal cross-sectional areas or have a cross-sectional area ratio other than 1:1. For example, the ratio of the cross-sectional areas of the separating chambers can be adapted to the cross-sectional areas of the containers 76 and 77 of cartridge 75, respectively to its metering ratio. The separating means is fixedly connected to the mixer element group 3.

The cartridge 75 has the same attaching means as in FIGS. 5 and 6, and the mixer 38 is attached to the cartridge by means of the coupling ring 31.

The third embodiment of the invention according to the FIGS. 14–19 comprises a locking ring 51 that is snapped onto and permanently attached to the cartridge 42. The cartridge 42 comprises two cylindrical containers or chambers 43 of equal cross-sectional area, two distal outlets 45 and 46, and an attaching means 47 for attaching the locking ring 51 and for limiting its rotational movement. The form of the attaching means 47 is a circular edge 49 with two lugs 44 of same width and arranged around the two distal outlets with a circular undercut 48 at its base.

The locking ring 51 (see FIGS. 16A and 16B) and 17, snaps over circular edge 49 of the attaching means of the cartridge and remains attached to it. The locking ring 51 has an inner circular groove 52 forming a cartridge side edge 53 and a mixer side edge 54. The cartridge side edge 53 has two opposed cutouts 55, the width of which corresponds to the lugs 44 of the attaching means whereby the inner diameter of the cartridge side edge 53 is slightly smaller than the outer diameter of the circular edge 49 of the attaching means of the cartridge. For snapping the locking ring to the cartridge, the ring is positioned so that the cutouts of its cartridge side edge are placed above the lugs of the attaching means and the ring is then pushed onto the cartridge so that the remaining cartridge side edge of the locking ring slides into the circular undercut 48 of the attaching means. The locking ring is also provided with a serration 58 for better manual gripping.

The mixer side edge 54 has two opposite cutouts 56 and 57 of different width corresponding to the lugs 10 and 11 of the mixer for insertion in one position only. These two cutouts are arranged at 90° to the cutouts 55 of the cartridge side edge. Thus, when the mixer 59 is to be attached to the locking ring on the cartridge and the locking ring is rotated by 90°, the remaining inside flange parts of both the cartridge side edge and the mixer side edge serve as bayonet retaining means to encompass the mixer lugs 10 and 11 as well as the lugs 44 of the attaching means 47 of the cartridge for strong securement.

FIGS. 18 and 19 show cartridge 42 of FIG. 14 with a mixer 59, which is similar to mixer 1 of FIG. 1 with the same mixer inlet section 5 with separate female inlets 6 and 7, except that the housing 60 is not rotatable around the integral internal parts of the mixer and has no ribs 8, and the two bayonet lugs 10 and 11 are of different widths. FIG. 18 shows the mixer introduced within the locking ring 51 with the locking ring in its locked position and FIG. 19 shows a section along the line XIX–XIX in FIG. 18 of the same assembly at 90°. It is evident that a mixer with separated inlet chambers can be attached likewise and also that a



5,918,772

7

cartridge may be one having containers with different cross-sectional areas as in FIG. 5.

The above described system of the coded attachment of the mixer also allows for the coded attachment of closure caps, adapters etc., thus preventing cross contamination and allowing closure cap re-use.

The first embodiment of a coded closure cap 61, FIGS. 20 and 21, consists of two parts. The insert 62 has two male plugs 63 for closing the outlets of a cartridge, for example the distanced outlets 14 and 15 of cartridge 12 of FIG. 3.

In this embodiment it is shown how the sealing effect of a plug at the cartridge outlet can be improved by providing the male plug 63 with a second rim 63A reaching over the female cartridge outlet. The provision of such a male plug with a circumferential rim is of course not limited to this example.

The rotatable attaching means has two bayonet lugs 64 and 65 of different widths corresponding to the lugs 10 and 11 of mixer 1 of FIG. 1. The outer surface of the cap is provided with ribs 66 and a collar 70 for better gripping. The coded attachment of the closure cap to cartridge 12 or 24 is analogous to the attachment of mixer 1.

The second embodiment, FIGS. 22 and 23, consists of a coded closure cap 67, which also has two plugs 68 for closing the outlets of a cartridge, for example the distanced male outlets 14 and 15 of cartridge 35 of FIG. 9, and a slot 69 similar to slot 30 at mixer 25 for coded cooperation with nose piece 36 of cartridge 35. The outer surface of the cap is also provided with a collar 70 for better manual gripping. The attachment of the cap to cartridge 35 is achieved with coupling ring 31 of FIG. 11, analogous to the attachment of mixer 25 to that cartridge.

The third embodiment of a coded closure cap 71, FIGS. 24 and 25, is similar to the second embodiment and comprises two plugs 72 for closing the distanced male outlets 45 and 46 of cartridge 42 of FIG. 14. FIG. 25 shows the cartridge side of the closure cap with two bayonet lugs 73, 74 of different width and diametrically opposed on the edge facing the cartridge. This closure cap is attached by means of the locking ring 51 of FIGS. 18 and 19 and is also provided with a collar 70 for better manual gripping.

The ring-shaped bayonet attachment means of the cartridge ensures a better stability of its outlet area and stronger retaining of the bayonet lugs compared with prior art bayonet attachment means.

In the case of utilizing the advantages of the ring-shaped bayonet socket alone and without the need for coded attachment, the bayonet lugs 10 and 11, 32 and 33, 64 and 65 at the mixer or closure cap or accessory as well as the corresponding bayonet cutouts 19 and 20 at the retaining means at the cartridge or 56 and 57 at the locking ring 51, may have the same widths. This applies also in the case when more than two lugs and corresponding cutouts are used, for example three or four respectively.

The FIGS. 26–28 show a further embodiment of the invention with an inverse bayonet arrangement as compared with those of the bayonet arrangement of the mixer and cartridge according to FIGS. 1–4. FIG. 26 shows a mixer 80 comprising a mixer housing 81 with mixer outlet 4 and a mixer inlet section 82 containing two separated inlet parts 83 and 84 followed by a separating element 3S, which in turn is fixedly attached to a properly aligned element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by matching the coding means of mixer and cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 81 of the mixer about the integral

8

internal mixer parts comprising separate female inlets 83 and 84, the separating element 3S and the mixer element group 3. The mixer element group or part thereof could also be prealigned and be fixedly assembled within the mixer housing.

The mixer housing 81 is provided with longitudinal ribs 8, which end at the larger diameter 85. The larger end of the mixer housing has a nose piece 89, which provides a highly visible coded guide for alignment and insertion into the slotted prong 90 of the cartridge. The mixer housing 81 is also provided with a ring shaped bayonet socket attachment means 100 comprising two bayonet flange parts 94 and 95 acting as bayonet retaining means, having two cut outs 96 and 97 in between.

The cartridge 86 has two cylindrical containers 87 and 88 with the distanced outlets 14 and 15 for fitting and sealing within the mixer inlet section 82. The cartridge front 86A is provided with a slotted prong 90 and a guide piece 91 for preventing incorrect insertion of the mixer and further with two bayonet flanges 92 and 93 with tapered wedge shaped edges, corresponding in width with the mixer cutouts 96 and 97, and with reduced diameter cutouts 98 and 99 in between.

For attaching the mixer to the cartridge, the mixer inlet part 82 is introduced into the cartridge by aligning the nose piece 89 of the mixer housing within the slotted prong 90 while the part 91 acts as a guide piece as the mixer inlets are pushed onto and over the cartridge distanced male outlets 14 and 15 such that the cartridge flanges 92 and 93 correspond to and enter within the mixer cutouts 96 and 97. Upon rotating the mixer housing, the mixer bayonet flange parts 94 and 95 progressively move against the cartridge flanges 92 and 93, because of their tapered wedge shaped depth, forcing the mixer 80 against the cartridge front 86A. During this mixer to cartridge attachment, the mixer housing 81 rotates 90° about the stationary integral internal mixer parts.

The above bayonet arrangement, wherein the ring-shaped bayonet socket is at the accessory, as shown for a rotating mixer housing, can also be used in analogous manner for previously shown embodiments and for the closure caps, with the exception of the locking ring solutions. Alternative coding means arranged around the outer periphery of the mixer housing are possible or is achieved by different widths of cutouts and matching flange parts.

FIGS. 29–31 show a further embodiment wherein the mixer is provided with male inlet parts fitting into and sealing within the female cartridge outlets.

FIG. 29 shows a mixer 101 comprising a mixer housing 102 with mixer outlet 4 and a mixer inlet section 103 containing two separate male inlets 104 and 105 followed by a separating element 3S which in turn is fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by matching the coding means of the mixer to the coding means of the cartridge, by pressing the mixer onto the cartridge and by rotating the mixer housing 102 about the integral internal mixer parts comprising separate male inlets 104 and 105, the separating element 3S and the mixer element group 3. The mixer element group or part thereof could also be prealigned and be fixedly assembled within the mixer housing.

The mixer housing 102 is provided with longitudinal ribs 8 which end at the larger diameter 106, the two lateral ends of, which are formed as bayonet lugs 107 and 108, FIG. 30, cooperating with the bayonet retaining means of the cartridge. The bayonet lugs do not have the same width, lug 107 being larger.

5,918,772

9

The cartridge 109, FIG. 31, has two cylindrical containers 110 and 111 with the distanced female outlets 112 and 113 for fitting and sealing over the male mixer inlets 104 and 105. The cartridge front 114 is provided with the same bayonet means 16 as the cartridge of FIG. 4, comprising a ring shaped bayonet socket.

FIGS. 32–34 show a further embodiment wherein the mixer is provided with a male and a female inlet part fitting and sealing into/over the female/male cartridge outlets.

FIG. 32 shows a mixer 115 comprising a mixer housing 116 with outlet 4 and a mixer inlet section 117 containing a separate male inlet 118 and a separate female inlet 119 followed by separated chambers 117A and 117B, which in turn are fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 116 about the integral internal mixer parts comprising separate male inlets 118 and 119, the separated chambers 117A and 117B and the mixer element group 3. The mixer element group or part thereof could also be prealigned and be fixedly assembled within the mixer housing.

The mixer housing 116 is provided with longitudinal ribs 8, which end at the larger diameter 120, the two lateral ends of which are formed as bayonet lugs 121 and 122, FIG. 33, cooperating with the bayonet retaining means of the cartridge. The bayonet lugs do not have the same width, bayonet lug 121 being larger.

The cartridge 123 has two cylindrical containers 124 and 125 with one distanced male outlet 126 and one distanced female outlet 127 for, respectively, fitting and sealing within the separate female inlet 119 and over the separate male inlet 118 of the mixer. The cartridge front 128, FIG. 34, is provided with the same bayonet means 16 as the cartridge of FIG. 4, comprising a ring shaped bayonet socket.

The embodiments of FIGS. 35–43 show sector-shaped bayonet sockets instead of complete ring-shaped ones. The function and the attaching of the accessory are the same as in the previous embodiments, so that the three different embodiments of the bayonet means are illustrated in one respective example of mixer and cartridge. It is obvious that the sector-shaped bayonet socket and similar means can be provided on all other embodiments also.

FIG. 35 shows a mixer-cartridge assembly with a mixer 130 comprising a mixer housing 131 with outlet 4 and a mixer inlet section 132 containing two separate male inlets 133 and 134 followed by separating chambers 133A and 134A which in turn are fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 131 about the integral internal mixer parts comprising separate male inlets 133 and 134, the separated chambers 133A and 134A and the mixer element group 3. The mixer element group or part thereof could also be prealigned and be fixedly assembled within the mixer housing.

The mixer housing 131 is provided with longitudinal ribs 8 which end at the larger diameter 135, the two lateral ends of, which are formed as bayonet lugs 136 and 137, FIG. 37, cooperating with the sector-shaped bayonet sockets 145, 146, serving as bayonet retaining means of the cartridge. The bayonet lugs have the same width and are provided each with a rib 136A and 137A at its end which both strengthen each lug and acts as a stop as well as ensuring that the mixer can be turned and attached in one direction only. The upper surface of the lugs may have inclined surface parts so as to

10

enforce the locking ability by an axial load. Corresponding inclined surface parts may also be located on the corresponding surface of the cartridge sector shaped bayonet sockets.

The cartridge 138 has two cylindrical containers 139 and 140 with two distanced female outlets 141 and 142 for receiving and sealing over the separate male inlets 133 and 134. The cartridge front 143, FIG. 36, is provided with bayonet means comprising sector-shaped bayonet sockets 145, 146 which act as prongs and are closed on one side by a rib 145A and 146A which connects to the cartridge end wall so as to stiffen and increase the strength of the bayonet prong. The cutouts 149 and 150 between the sector shaped bayonet sockets allow for the introduction of the mixer bayonet lugs 136 and 137.

In this embodiment the bayonet lugs and the sector shaped bayonet sockets have approximately the same width. The coding is achieved by other coding means on the mixer and on the cartridge. The cartridge front 143 is provided with a T-shaped protrusion 151 arranged between the two outlets and the mixer inlet face is provided with a similar protrusion 152 arranged off centre between the mixer inlets, see FIGS. 36 and 37.

The two T-shaped coding means allow the attachment of the mixer in one orientation only since, when putting the mixer onto the cartridge such that when the two protrusions are laying one upon the other, they will prevent the introduction of the mixer inlets into the cartridge outlets and also any contact between the cartridge outlets and the mixer inlets or plugs of closure means thus preventing cross contamination and prohibiting mixer/accessory attachment. It is obvious that the coding protrusions can have any shape other than a T-form, and could be, e.g., in the form of a keyway allowing only one defined position in which to introduce the mixer having a corresponding protrusion, or two differently shaped keyways and corresponding protrusions.

The coded alignment can be facilitated by visual coding means, e.g., a marking 153 at the cartridge outlet end and a marking 154 at the bayonet lug 137 of the mixer on the same side as the coding protrusion.

In the embodiment of FIGS. 38–40, the coding is achieved by cutouts of different widths between the lugs. FIG. 38 shows a mixer-cartridge assembly with a mixer 155 with a mixer housing 156, outlet 4 and integral internal mixer parts comprising two separate inlets 157 and 158 ending into a disc-shaped flange and followed by separated chambers 157A and 158A which in turn are fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 156 about the integral internal mixer parts. The mixer element group 3 or part thereof, may also be prealigned and fixedly assembled within the mixer housing.

The mixer housing 156 is provided with longitudinal ribs 8, which end at the larger diameter 159, the two lateral ends of which are formed as bayonet lugs 160 and 161, FIG. 40, cooperating with the sector shaped bayonet retaining means of the cartridge. In this FIG. 38 and also in FIGS. 13, 32, 35 and 45 it is shown that the inlet end of the mixer housing has not only one cylindrical enlargement but two, e.g., one 159 at the inlet, lodging and sealing against the separate inlets 157, 158, followed by the second part 159A having an intermediate diameter and lodging and sealing against the separating means 157A, 158A. The bayonet lugs have the same widths but the gaps or cutouts 194, 195 between them



5,918,772

11

are different, corresponding to the different widths of the sector shaped bayonet sockets on the cartridge.

These bayonet lugs 160, 161, can be provided each with a rib 167, FIG. 40, on the reverse side of the mixer inlet which both strengthen the lug and act as stop as well as limiting rotation in one direction only so as to prevent the mixer from being attached at 180° to the correct alignment. The upper surface of the lugs may have inclined parts, not shown, so as to enforce the locking and sealing ability by an axial force. Corresponding inclined parts, not shown, may also be located on the corresponding surface of the cartridge sector shaped bayonet sockets.

The cartridge 162 has two cylindrical containers 163 and 164 with two distanced female outlets 165 and 166 for receiving and sealing over the separate male inlets 157 and 158. The cartridge front 168, FIG. 39, is provided with bayonet means, comprising two sector-shaped bayonet sockets.

In FIG. 39, the bayonet means at the cartridge comprises two diametrically opposed sector-shaped bayonet sockets 169 and 170 acting as bayonet prongs for the bayonet lugs of the mixer, the two sockets having different widths, socket 169 having the greater width. The two cut outs 171 and 172 between the sockets allow for the introduction of the corresponding mixer bayonet lugs 160 and 161 into the sector shaped bayonet sockets 169, 170. As shown in this Figure, the passages of the bayonet sockets 169 and 170 commence as straight passages but become curved from the mid point onwards so as to achieve a greater strength against bayonet lug axial forces.

The passages can be wholly curved, without straight parts, and wholly or partly curved passages can also be provided on the ring-shaped bayonet attachment means.

In order to prevent any inadvertent contact whatsoever of the mixer or accessory inlet or inlets with the cartridge outlet or outlets by any form of tilting or tipping of one against the other during incorrect alignment the larger cut out 195 at the mixer is provided with a V-shape nose 192 corresponding to a V-shape incision 193 at the larger socket 169 such that the mixer is kept outside of the narrower bayonet socket 170 by the V-shape nose 192.

In this embodiment also the coded alignment can be facilitated by visual coding means, e.g., marking 153 at the cartridge and marking 154 at the the corresponding lug.

In case no univocal attachment of a mixer to the cartridge 162 is necessary the cut outs between the lugs of the mixer must be large enough to fit over the larger retaining means of the cartridge, whereas the visual coding means rest the same as previously described.

FIGS. 41–44 show a similar arrangement to that of the FIGS. 38–40 except that the mixer 200 is separate from coupling ring 196, the latter being rotated about the stationary mixer during the final rotary locking attachment of the coupling ring bayonet lugs 160A, 161A, into the sector shaped bayonet sockets 169, 170 of the cartridge 162.

FIG. 41 shows mixer 200 with the outlet 4 and comprising a housing 201 containing the mixer element group 3 in alignment with inlet part 197, the latter only partially contained within the mixer housing and comprising separate male inlets 157B, 158B and separate chambers 157C, 158C. A ridge 198 lodges and seals the inlet part 197 within the mixer housing. The coupling ring 196 is preassembled and prealigned with the mixer inlet part 197 via a groove 199, FIG. 41, in the coupling ring 196. FIG. 43 shows coupling ring 196 with the same coded bayonet lugs 160A, 161A, cut outs 194A, 195A, visual coding 154 and V-shape nose coding 192A as used in the embodiment according to FIG. 40.

12

FIG. 44 shows the mixer 200 and the cartridge 162 when assembled together. Prior to such assembly, the coupling ring 196 may be pre-assembled to the mixer under sufficient tension such that both components are held together in the correct relative alignment for initial visual coded and initial axial mechanical coded contact and attachment of the mixer inlets 157B, 158B to the cartridge outlets 165, 166 on the cartridge prior to the final rotary locking attachment of the coupling ring as described above. In this embodiment therefore, there is no rotation of the mixer housing 201 about the mixer inlet part 197 and element group 3 during attachment.

In the embodiment according to FIGS. 45–47 the sector-shaped bayonet sockets are at the mixer and the bayonet lugs at the cartridge, in analogy to the embodiment according to FIGS. 26–28.

FIG. 44 shows a mixer-cartridge assembly with a mixer 173 comprising a mixer housing 174 with outlet 4 and a mixer inlet section 175 containing the integral internal parts comprising two separate male inlets 176 and 177 followed by separated chambers 176A and 177A which in turn are fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 174 about the separate male inlets 176 and 177, the separated chambers 176A and 177A and the mixer element group 3. The mixer element group or part thereof could also be pre-aligned and be fixedly assembled within the mixer housing.

The mixer housing 174 is provided with longitudinal ribs 8, which end at the larger diameter 178, the two lateral ends of which are formed as two diametrically opposed sector-shaped bayonet sockets 179 and 180 (see FIG. 43) acting as prongs which are both closed at one side by a rib 179A and 180A connecting to the mixer wall so as to stiffen and increase the strength of the bayonet prong. The cut outs 181 and 182, between the sockets, allow for the introduction of the cartridge bayonet lugs cooperating with the bayonet retaining means of the mixer.

The cartridge 183 has two cylindrical containers 184 and 185 with two distanced female outlets 186 and 187 for fitting and sealing over the separate male inlets 176 and 177. The cartridge front 188, FIG. 42, is provided with bayonet means, comprising sector-shaped bayonet lugs 190 and 191 having the same width and each being provided with a rib 190A and 191A at it's end which strengthens the lug and act as a stop as well as limiting rotation in one direction only so as to prevent the mixer from being attached at 180° to the correct alignment. The upper surface of the lugs may have inclined surface parts, not shown, so as to enforce the locking ability by an axial load. Corresponding inclined surface parts, not shown, may also be located on the corresponding surface of the mixer sector shaped bayonet sockets.

The lugs and the cutouts have approximately the same width. Thus the required coding is achieved by other coding means on the mixer and on the cartridge. Therefore the cartridge front 188 is provided with the T-shaped protrusion 151 arranged between the two distanced female outlets and the mixer inlet face is provided with a similar shaped protrusion 152 arranged off center between the mixer inlets. See FIGS. 46 and 47.

The two T-shaped coding means allow the introduction of the mixer in one position only, since the placing of the mixer onto the cartridge is such that, when the two protrusions are laying one upon the other, they will prevent the introduction

5,918,772

13

of the mixer separate male inlets into the cartridge distanced female outlets as well as any contact between the cartridge outlets and the mixer inlets, thus prohibiting cross contamination and mixer/accessory attachment. It is obvious that the coding protrusions can have any shape other than a T-form.

There are situations where the T-shaped coding protrusion give not a 100% protection to warrant no cross-contamination. In the FIGS. 48–58 show several coding protrusions which are believed to warrant that no cross-contamination can occur even if the mixer is introduced onto the cartridge in the wrong sense. To this end the coding protrusions are arranged thus that no tilting around the axis connecting the centers of the two outlets of the cartridge, which could cause this contamination.

The cartridge 210 of FIG. 48 is similar to the cartridge 162 of FIG. 39 and has the same two cylindrical containers with two distanced female outlets 165 and 166 for receiving and sealing over the separate male inlets 157 and 158. The cartridge front 211 is provided with the bayonet means comprising two diametrically opposed sector-shaped bayonet sockets 169 and 170 acting as bayonet prongs for the bayonet lugs of the mixer, the two sockets having different widths, socket 169 having the greater width. The two cutouts 171 and 172 between the sockets allow for the introduction of the corresponding mixer bayonet lugs 160 and 161 into the sector shaped bayonet sockets 169, 170. As shown in this Figure, the passages of the bayonet sockets 169 and 170 commence as straight passages but become curved from the mid point onwards so as to achieve a greater strength against bayonet lug axial forces.

In addition to the cartridge of FIG. 39, the front of this cartridge 210 is provided with a coding protrusions 212, consisting of two pins 213 arranged symmetrically to the axis connecting the centers of the outlets but asymmetrically as regards the transversal middle axis, e.g., on the side of one outlet.

FIG. 49 shows a mixer 214 similar to the mixer 155 of FIG. 38 with a mixer housing 156, outlet 4 and integral internal mixer parts comprising two separate inlets 157 and 158 followed by separated chambers 157A and 158A, which in turn are fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 156 about the integral internal mixer parts. The mixer element group 3 or part thereof, may also be prealigned and fixedly assembled within the mixer housing.

The mixer housing 156 is provided with longitudinal ribs 8, which end at the larger diameter 159, the two lateral ends of which are formed as bayonet lugs 160 and 161 cooperating with the sector shaped bayonet retaining means of the cartridge. This mixer 214 can also have two enlargement, e.g., one 159 at the inlet, lodging and sealing against the separate inlets 157, 158, followed by the second part 159A having an intermediate diameter and lodging and sealing against the separating means 157A, 158A. The bayonet lugs have the same widths but the gaps or cut outs 194, 195 between them are different, corresponding to the different widths of the sector shaped bayonet sockets on the cartridge, and have also ribs.

In addition to the mixer of FIG. 38 the inlet part of this mixer 214 is provided with the same coding protrusions 215 as those of the cartridge, consisting of two pins 216 and arranged in accordance to the pins 213 of the cartridge such that the mixer can only be introduced the correct way with regard to the other coding means without the possibility of tilting if introduced by force the wrong way.

14

The FIGS. 51–58 show further arrangement and forms of coding protrusions 212, 215, whereby the cartridge as well as the mixer are always the same as in FIGS. 48–50 and only the coding protrusions are provided with numerals, the other parts being the same.

FIGS. 51 and 52 show a coding protrusions 212 on the cartridge front consisting of two bars 217 arranged symmetrically to the transversal middle axis of the cartridge but asymmetrically to the axis connecting the centers of the outlets. The two bars 218 of the mixer inlet part are arranged in accordance to those of the cartridge such that introduction and attachment of the mixer onto the cartridge is only possible in one position.

FIGS. 53 and 54 show a coding protrusions 212 on the cartridge front consisting of two D-shaped protrusion 219 arranged symmetrically to the transversal middle axis of the cartridge but asymmetrically to the axis connecting the centers of the outlets, with both flat sides looking in one direction. The two D-shaped protrusions 220 of the mixer inlet part are arranged in accordance to those of the cartridge such that introduction and attachment of the mixer onto the cartridge is only possible in one position.

FIGS. 55 and 56 show a coding protrusions 212 on the cartridge front consisting of a male plug 221 and a female plug 222 arranged symmetrically. The male plug 223 and the female plug 224 of the mixer inlet part are arranged in accordance to those of the cartridge such that introduction and attachment of the mixer onto the cartridge is only possible in one position.

FIGS. 57 and 58 show a particularly effective coding protrusions 212 on the cartridge front consisting of a bar 225 on one side of the axis connecting the centres of the outlets and two spaced bars 226 on the other side of this axis, arranged symmetrically to the transversal middle axis of the cartridge. The single bar 227 and the double bar 228 of the mixer inlet part are arranged in accordance to those of the cartridge such that introduction and attachment of the mixer onto the cartridge is only possible in one position.

All these coding protrusions prevent efficiently tilting of the mixer during attachment to the cartridge and hence cross-contamination.

The coded alignment can be facilitated by visual coding means, e.g., the marking 153 at the cartridge, opposite the protrusion and the marking 154 at the lug of the mixer near the coding protrusion.

It follows from the embodiment according to FIGS. 32–34 that the mixer inlets and the cartridge outlets may be either female or male respectively and it follows also that it is possible to provide the mixer with one female and one male inlet fitting over/into the corresponding male/female outlet of the cartridge.

This latter arrangement provides for a further coding means since only one position is possible for matching the mixer or closure means to the cartridge. This mixed arrangement of coding and coding means is independent from the manner of attachment with a coupling ring, locking ring or rotatable mixer housing.

While the different widths of the bayonet lugs provide for a distinct coding means, it might be advantageous to enhance this effect by visualisation of the coding by optical means such as different colors, a notch and a marking or by providing one lug of the accessory with a cutout and the corresponding nose at the cartridge bayonet means. This can be done either for visual marking one of the coding parts or for the coding itself.

Cartridges separated with one single wall, e.g., according to U.S. Pat. No. 5,333,760, cannot exclude chemical migra-



5,918,772

15

tion through such a single wall separation barrier and therefore separation at the cartridge outlets is not sufficient to prevent migration and therefore a reaction within the cylinders during storage.

It follows in particular from the FIGS. 5, 14, 26, 29, 32, 35, 38 and 41 that it is advantageous to provide for a single piece cartridge consisting of two complete, preferably cylindrical containers which are substantially separated by an air gap L in between, see e.g. FIG. 32. This assures a total chemical separation along the whole length where the chemicals are contained, ahead of the cylinder pistons, all the way to the top of the outlets where, during storage, a closure means is installed. During dispensing, this separation is further maintained within the mixer up to the first dividing element 3D of the mixer element group.

The invention however, is not limited to air gap separated containers and applies as well to cartridges with containers separated by one single wall according to FIG. 3.

It follows from the above description that the inventive cartridge to accessory attachment combination provides in particular for cartridge containers separated by an air gap up to and including the individual outlets and for a port to port coded alignment for same or dissimilar size ports, with no cross-contamination caused by rotation or random attachment, while maintaining separation past the interface and well into the mixer, so as to hinder the spreading of any possible reaction and plugging of the components at the interface and back into the cartridge outlets. This combination also provides optimization of the mixing performance especially, but not uniquely, for ratios other than 1:1.

While the foregoing description and the drawing of the cartridge embodiments pertained to multiple component cartridges with side-by-side containers the teaching of the present invention is not limited thereto and can be applied as well to cartridges with concentric containers or otherwise arranged and formed containers.

However, the principle of coded attachment ensures both the correctly aligned connection of a mixer or accessory to cartridge outlets since only one position of the mixer or accessory is possible and, in the case of the re-connection of mixer or closure cap to a cartridge, eliminates the possibility of cross-contamination.

Furthermore, and in respect to mixers, all the above described embodiments have the advantage of comprising the minimum number of parts and of being compact, resulting in low molding and assembly costs since the whole inlet section comprising the separating means and the mixer element group is made in one piece. Also the integral construction of this internal part ensures proper alignment thus providing optimum mixing efficiency.

In the case of the first embodiment according to FIG. 1 when a relatively long mixer element group is used and where rotational friction between this mixer element group and the mixer housing might cause problems, it may be preferable to separate a part or the whole of the mixer element group from the separating means of the inlet section such that a part or the whole of the mixer element group may be fixedly assembled within the housing and therefore it rotates with the housing while connecting the mixer to the cartridge.

In this case—and as seen from the mixer inlet to the mixer outlet—the leading edge of the first element of the mixer element group, or of a portion thereof, must be fixedly assembled within the housing in a pre-aligned position. Therefore, after rotating the housing so as to attach the mixer to the cartridge, correct alignment of the elements is

16

achieved such that each of the two material streams leaving the separating means, or the first element group attached to the separating means, will be evenly divided by the leading edge of the first element of the element group, or portion thereof attached to the housing, for optimum mixing efficiency.

It is evident that instead of cylindrical inlets and outlets, D-shaped or differently shaped similar or dissimilar sized inlets and outlets are possible. Furthermore, the same principle can also be used for a dispensing device, or cartridge, for more than two components.

We claim:

1. A mixer for a cartridge, the cartridge having a plurality of chambers each having an outlet, the mixer comprising:

a housing;

a mixer element disposed in said housing;

a plurality of inlets for engagement with the outlets of the cartridge and mounted on said housing; and

a bayonet coupling on said housing for detachably connecting said mixer to the multichamber cartridge, said bayonet coupling having locked and unlocked positions;

said inlets being fixedly disposed relative to said housing so that said housing is disposed in the same position relative to the cartridge when said bayonet coupling is in either said locked position or said unlocked position.

2. A mixer according to claim 1, wherein said bayonet coupling comprises a pair of diametrically opposed lugs.

3. A mixer according to claim 2, wherein said lugs are fixed relative to said housing.

4. A mixer according to claim 3, wherein one of said lugs is larger than the other lug.

5. A mixer according to claim 1, wherein said bayonet coupling comprises a coupling ring connected to one end of said housing around said inlets, said coupling ring being rotatable relative to said housing.

6. A mixer according to claim 5, wherein said coupling ring has a pair of diametrically opposed lugs.

7. A mixer according to claim 6, wherein one of said lugs is larger than the other lug.

8. A mixer according to claim 5, wherein said coupling ring has a pair of diametrically opposed cutouts.

9. A mixer according to claim 8, wherein one of said cutouts is larger than the other cut-out.

10. A mixer according to claim 8, wherein said coupling ring has a coding comprised of one of a radially extending protrusion or cutout.

11. A mixer for a cartridge, the cartridge having a plurality of chambers each having an outlet, the mixer comprising:

a housing;

a mixer element disposed in said housing;

a plurality of inlets for engagement with the outlets of the cartridge and mounted on said housing;

a bayonet coupling on said housing for detachably connecting said mixer to the multichamber cartridge, said bayonet coupling having locked and unlocked positions; and

a coding element that permits said inlets of said housing to be aligned and connected to the outlets of the cartridge in only one orientation.

12. A mixer according to claim 11, said inlets being fixedly disposed relative to said housing so that said housing is disposed in the same position relative to the cartridge when said bayonet coupling is in either said locked position or said unlocked position.

5,918,772

17

13. A mixer according to claim 11, wherein said bayonet coupling comprises a pair of differently sized diametrically opposed lugs, wherein said coding element comprises said differently sized lugs.

14. A mixer according to claim 13, wherein said lugs are fixed relative to said housing.

15. A mixer according to claim 13, wherein said coding element further includes one of a cutout for protrusion formed on said bayonet coupling.

16. A mixer according to claim 13, wherein said bayonet coupling comprises a coupling ring connected to one end of said housing around said inlets, said coupling ring being rotatable relative to said housing.

17. A mixer according to claim 13, wherein said diametrically opposed lugs are formed on said coupling ring.

18. A mixer according to claim 11, wherein said bayonet connector comprises a coupling ring connected to one end of said housing around said inlets, said coupling ring being rotatable relative to said housing, said coupling ring having a pair of differently sized diametrically opposed cutouts, wherein said coding element comprises said differently sized cutouts.

19. A mixer according to claim 18, wherein said coding element further comprises a radially extending protrusion formed on said coupling ring.

20. A cartridge for a mixer, the mixer having a plurality of inlets, the cartridge comprising:

a plurality of chambers each having an outlet for engagement with the inlets of the mixer;

a bayonet coupling on the cartridge for detachably connecting said cartridge to the mixer, said bayonet coupling having locked and unlocked positions; and

a coding element that permits said outlets of said chambers to be aligned and connected to the respective inlets of the mixer in only one orientation.

21. A cartridge according to claim 20, wherein said bayonet coupling comprises means for maintaining the mixer in the same fixed position relative to the cartridge when said bayonet coupling is in either said locked position or said unlocked position.

22. A cartridge according to claim 21, wherein said bayonet coupling comprises a pair of differently sized diametrically opposed sockets positioned around said outlets, wherein said coding element comprises said differently sized sockets.

23. A cartridge according to claim 20, wherein said bayonet coupling comprises a locking ring rotatably mounted to one end of said chambers around said outlets, said locking ring having a pair of differently sized diametrically opposed cutouts, wherein said coding element comprises said differently sized cutouts.

24. A cartridge according to claim 23, wherein one of said sockets has a radially extending groove, said coding element further comprising said groove.

25. A cartridge according to claim 20, wherein said chambers are differently sized.

26. A cartridge according to claim 20, wherein said outlets are differently sized.

27. A dispensing device comprising a cartridge and a mixer, said cartridge comprising:

a plurality of chambers each having an outlet, and

a first bayonet coupling; and

a said mixer comprising:

a housing with a plurality of inlets corresponding in number to said outlets, each inlet being configured to engage a respective one of said outlets;

18

a mixer element disposed in said housing; and  
a second bayonet coupling complementary with said first bayonet coupling of said cartridge, said first bayonet coupling being detachable from said second bayonet coupling and together forming a detachable bayonet assembly, said first and second bayonet couplings having locked and unlocked positions;

said inlets being fixedly disposed relative to said housing so that said housing is disposed in the same position relative to the cartridge when said bayonet coupling is in either said locked position or said unlocked position.

28. A dispensing device according to claim 27, wherein said first bayonet coupling comprises a pair of diametrically opposed sockets and said second bayonet coupling comprises a pair of diametrically opposed lugs complementary to said sockets.

29. A dispensing device according to claim 28, wherein said lugs are fixed relative to said housing.

30. A dispensing device according to claim 27, wherein said first bayonet coupling comprises a locking ring rotatably mounted to one end of said chambers around said outlets, said locking ring having a pair of diametrically opposed cutouts, and said second bayonet coupling comprises a pair of diametrically opposed lugs fixed to said housing and complementary to said cutouts, wherein said locking ring is rotatable between a lock position and an unlock position, said cutouts receiving said lugs in said unlock position and said locking ring being rotatable to said lock position while said housing stays rotationally stationary relative to said cartridge.

31. A dispensing device according to claim 30, wherein said cutouts are differently sized and said lugs are complementarily sized so that said inlets of said mixer are aligned and connected to the respective outlets of said cartridge in only one orientation.

32. A dispensing device according to claim 27, wherein said first bayonet coupling comprises a pair of diametrically opposed cutouts formed at one end of said chambers around said outlets and said second bayonet coupling comprises a coupling ring having a pair of diametrically opposed lugs complementary with said cutouts, said coupling ring being rotatably mounted relative to said housing, wherein said coupling ring is rotatable between a lock position and an unlock position, said cutouts receiving said lugs in said unlock position and said coupling ring being rotatable to said lock position while said housing stays rotationally stationary relative to said cartridge.

33. A dispensing device according to claim 32, wherein said cutouts are differently sized and said lugs are complementarily sized so that said inlets of said mixer are aligned and connected to the respective outlets of said cartridge in only one orientation.

34. A dispensing device according to claim 27, wherein said first bayonet coupling comprises a pair of diametrically opposed sockets formed at one end of said chambers around said outlets and said second bayonet coupling comprises a coupling ring having a pair of diametrically opposed cutouts complementary with said sockets, said coupling ring being rotatably mounted relative to said housing, wherein said coupling ring is rotatable between a lock position and an unlock position, said cutouts receiving said lugs in said unlock position and said coupling ring being rotatable to said lock position while said housing stays rotationally stationary relative to said cartridge.

35. A dispensing device according to claim 34, wherein said cutouts are differently sized and said sockets are complementarily sized so that said inlets of said mixer are



5,918,772

19

aligned and connected to the respective outlets of said cartridge in only one orientation.

36. A dispensing device according to claim 34, wherein the coupling ring has a coding comprised of one of a radially extending protrusion or cutout.

37. A dispensing device according to claim 27, wherein said chambers are differently sized.

38. A dispensing device according to claim 27, wherein said outlets of said mixer have differently sized diameters and said inlets of said cartridge are sized complementary to said outlets having different diameters.

39. A dispensing device comprising

a cartridge,

a mixer, and

complementary coding elements formed on said cartridge and mixer,

said cartridge comprising:

a plurality of chambers each having an outlet, and

a first bayonet coupling,

said mixer comprising:

a housing with a plurality of inlets corresponding in number to said outlets, each inlet being configured to engage a respective one of said outlets,

a mixer element disposed in said housing, and

a second bayonet coupling complementary with said first bayonet coupling of said cartridge, said first bayonet coupling being detachable from said second bayonet coupling and together forming a detachable bayonet assembly; and

wherein said coding elements permit said inlets of said mixer to be aligned and connected to the respective outlets of said cartridge in only one orientation.

40. A dispensing device according to claim 39, wherein said inlets are fixed relative to said housing so that said housing stays in a fixed position relative to said cartridge while said first and second bayonet couplings are connected together.

41. A dispensing device according to claim 39, wherein said first bayonet coupling comprises a locking ring rotatably mounted to one end of said chambers around said outlets, said locking ring having a pair of differently sized diametrically opposed cutouts, and said second bayonet coupling comprises a pair of diametrically opposed lugs fixed to said housing and complementary to said cutouts, wherein said locking ring is rotatable between a lock position and an unlock position, said cutouts receiving said lugs in said unlock position and said locking ring being rotatable to said lock position while said housing stays rotationally stationary relative to said cartridge.

20

42. A dispensing device according to claim 39, wherein said first bayonet coupling comprises a pair of differently sized diametrically opposed cutouts formed at one end of said chambers around said outlets and said second bayonet coupling comprises a coupling ring having a pair of diametrically opposed lugs complementary with said cutouts, said coupling ring being rotatably mounted relative to said housing, wherein said coupling ring is rotatable between a lock position and an unlock position, said cutouts receiving said lugs in said unlock position and said coupling ring being rotatable to said lock position while said housing stays rotationally stationary relative to said cartridge.

43. A dispensing device according to claim 39, wherein said first bayonet coupling comprises a pair of differently sized diametrically opposed sockets formed at one end of said chambers around said outlets and said second bayonet coupling comprises a coupling ring having a pair of diametrically opposed cutouts complementary with said sockets, said coupling ring being rotatably mounted relative to said housing, wherein said coupling ring is rotatable between a lock position and an unlock position, said cutouts receiving said lugs in said unlock position and said coupling ring being rotatable to said lock position while said housing stays rotationally stationary relative to said cartridge.

44. A method of forming a dispensing device, comprising the steps of:

providing a cartridge having a plurality of chambers each having an outlet;

providing a mixer comprising a housing with a plurality of inlets corresponding in number to said outlets, each inlet being configured to engage a respective one of said outlets, and a mixer element disposed in said housing;

providing a two-part bayonet coupling assembly, with a first coupling part associated with said housing and a second coupling part complementary with said first coupling part and associated with said cartridge, wherein one of said first and second coupling parts is rotatably mounted respectively to said housing and said cartridge;

aligning the inlets of said mixer to the respective outlets of said cartridge and engaging said inlets to said outlets;

maintaining said inlets fixed relative to said housing so that said housing stays in a fixed position relative to said cartridge while rotating said one rotatably mounted coupling part to lock said mixer to said cartridge.

\* \* \* \* \*

## EXHIBIT E



US006186363B1

(12) **United States Patent**  
**Keller et al.**

(10) **Patent No.:** **US 6,186,363 B1**  
(45) **Date of Patent:** **Feb. 13, 2001**

(54) **BAYONET FASTENING DEVICE FOR THE ATTACHMENT OF AN ACCESSORY TO A MULTIPLE COMPONENT CARTRIDGE OR DISPENSING DEVICE**

(75) Inventors: **Wilhelm A. Keller**, Obstgartenweg 9, CH-6402 Merlischachen (CH); **Richard J. Wilson**, Andover, MA (US)

(73) Assignee: **Wilhelm A. Keller**, Merlischachen (CH)

(\*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

(21) Appl. No.: **09/348,038**

(22) Filed: **Jul. 6, 1999**

#### Related U.S. Application Data

(63) Continuation of application No. 08/563,109, filed on Nov. 27, 1995, now Pat. No. 5,918,772, which is a continuation-in-part of application No. 08/403,172, filed on Mar. 13, 1995, now abandoned, and a continuation-in-part of application No. 08/522,109, filed on Aug. 31, 1995, now abandoned.

#### (30) Foreign Application Priority Data

Aug. 24, 1995 (EP) ..... 95810531

(51) Int. Cl.<sup>7</sup> ..... **B67D 5/56**

(52) U.S. Cl. .... **222/145.6; 222/145.5; 222/137**

(58) Field of Search ..... **222/145.5, 145.6, 222/567, 326, 327, 136, 137; 285/360, 361, 376, 401, 396, 400, 402, 915**

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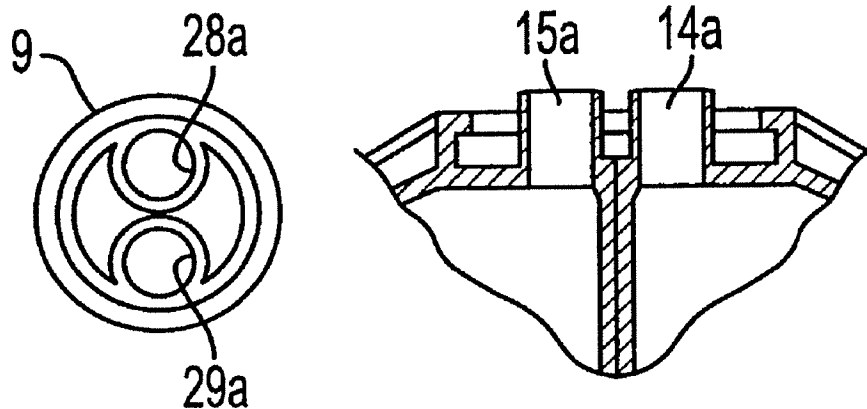
Primary Examiner—Kenneth Bomberg

(74) Attorney, Agent, or Firm—Foley & Lardner

#### (57) ABSTRACT

A bayonet attachment on a cartridge for attaching a mixer or accessory to a multiple component cartridge is formed as a ring-shaped bayonet socket with two internal recesses and two diametrically opposed cutouts forming one bayonet coupling part, whereas the bayonet attachment of the mixer or accessory comprises two bayonet lugs corresponding to the cutouts. In a preferred embodiment, the respective inlets of the mixer housing or the outlets of the cartridge have different sizes or shapes to provide coded alignment between the cartridge and the mixer.

7 Claims, 30 Drawing Sheets



US 6,186,363 B1

Page 2

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## U.S. Patent

Feb. 13, 2001

Sheet 1 of 30

US 6,186,363 B1

FIG. 1

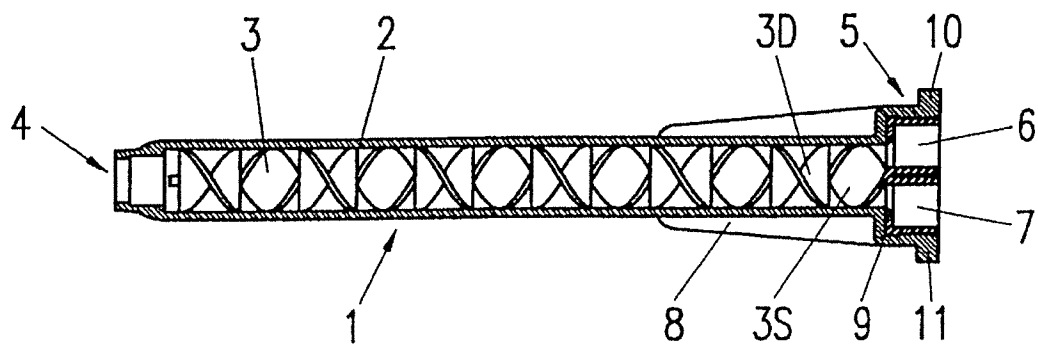


FIG. 2

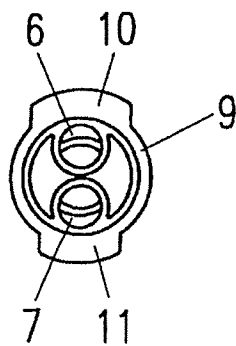


FIG. 3

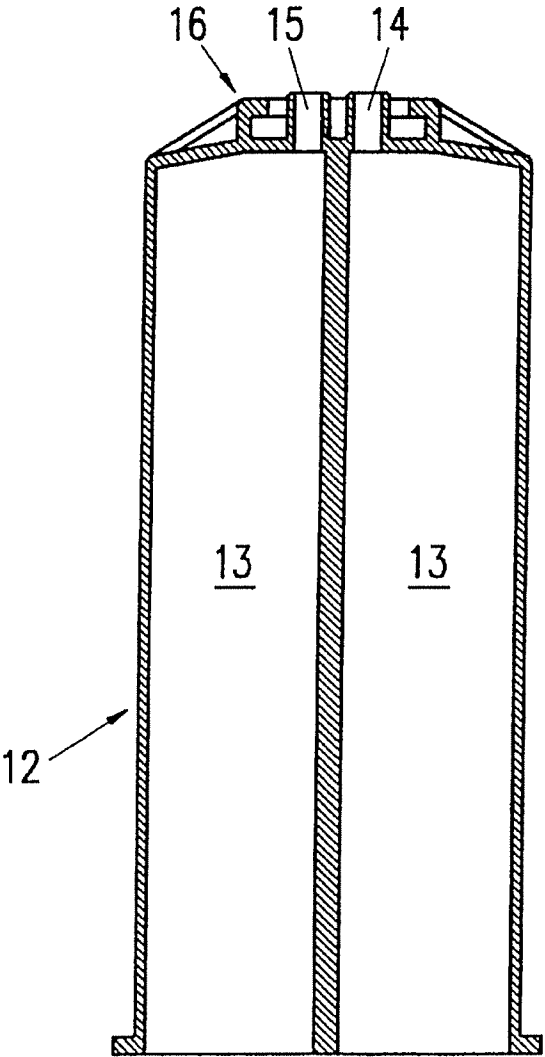


FIG. 4

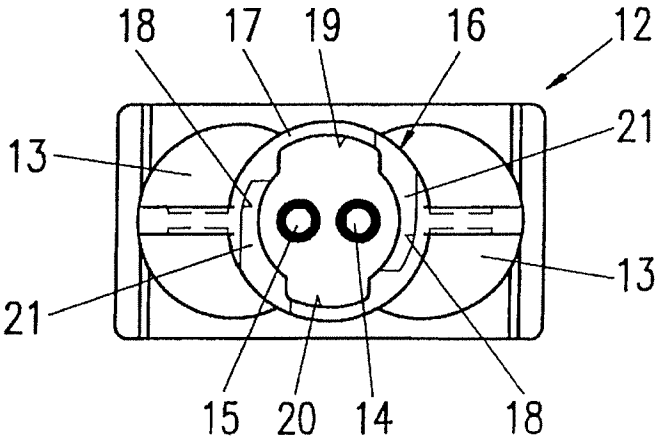


FIG. 5

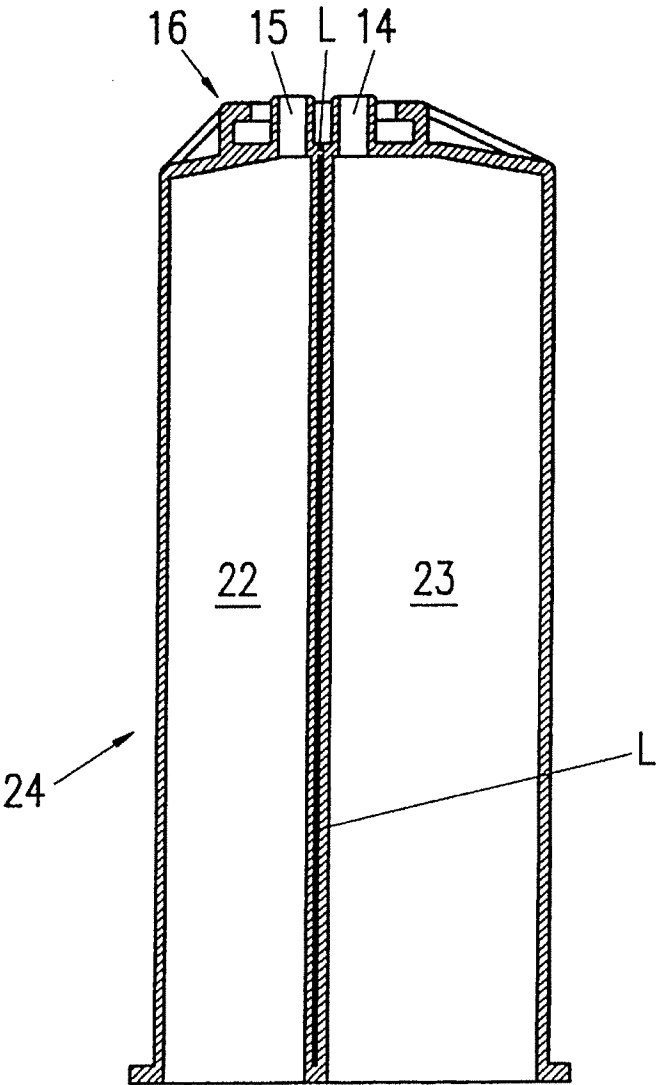


FIG. 6

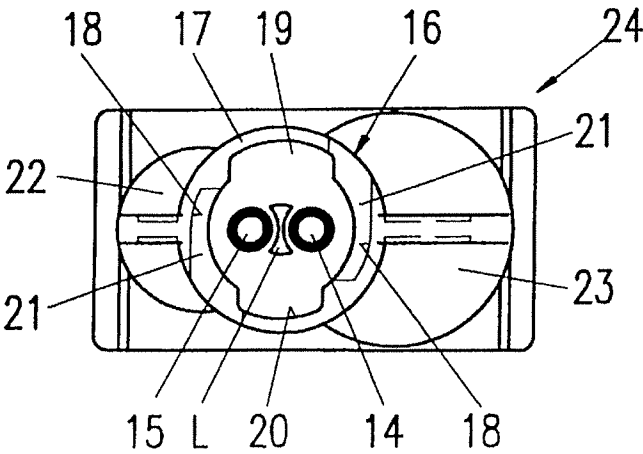


FIG. 7

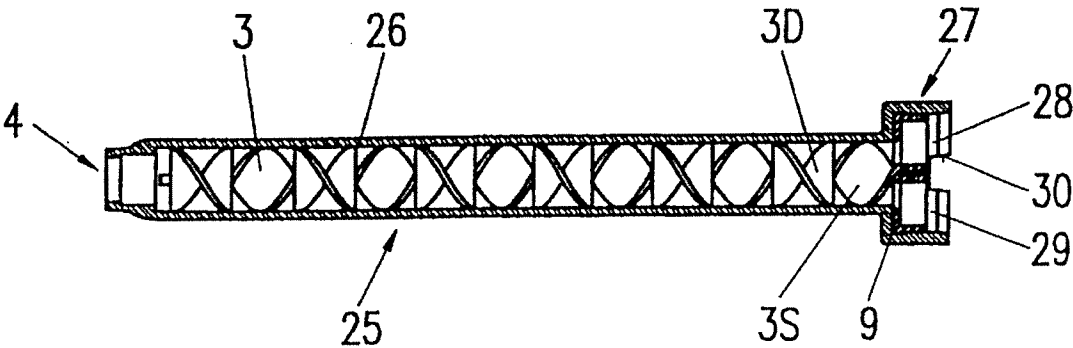
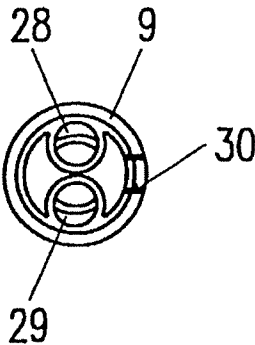


FIG. 8





U.S. Patent

Feb. 13, 2001

Sheet 5 of 30

US 6,186,363 B1

FIG. 8A

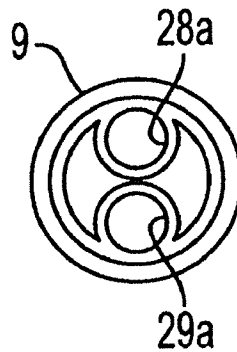


FIG. 9A

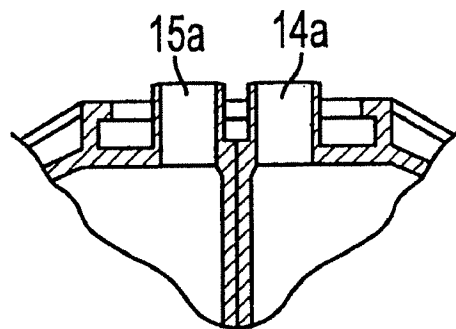


FIG. 9

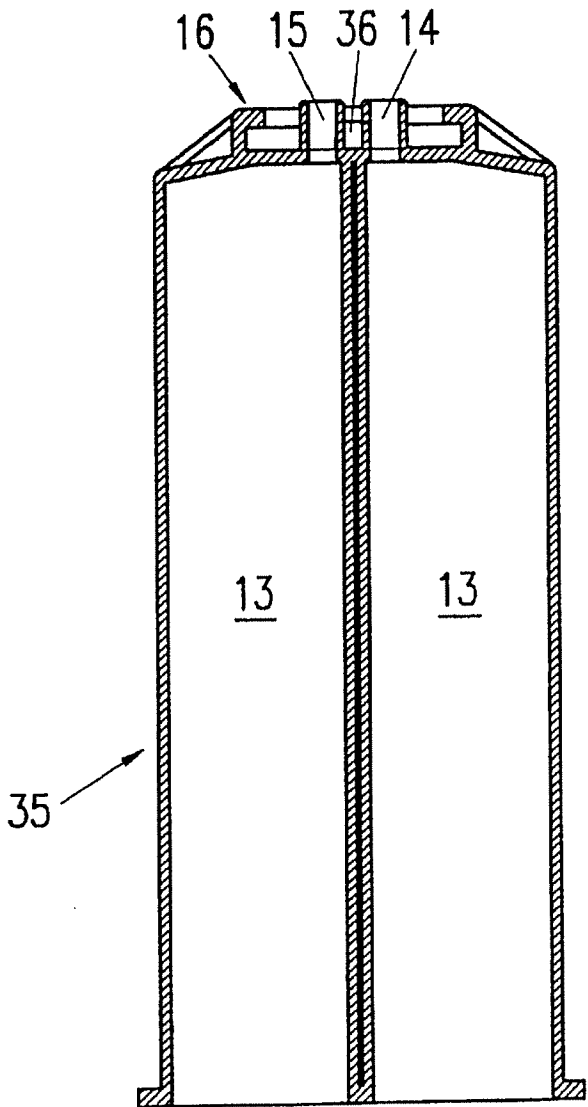
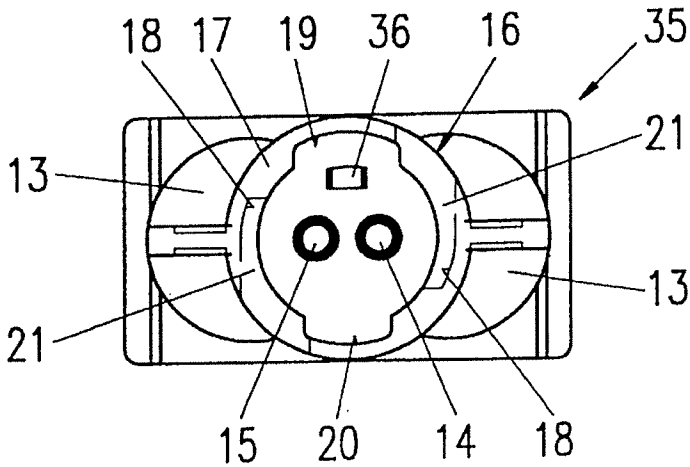


FIG. 10



**U.S. Patent**

Feb. 13, 2001

Sheet 7 of 30

**US 6,186,363 B1**

FIG. 11

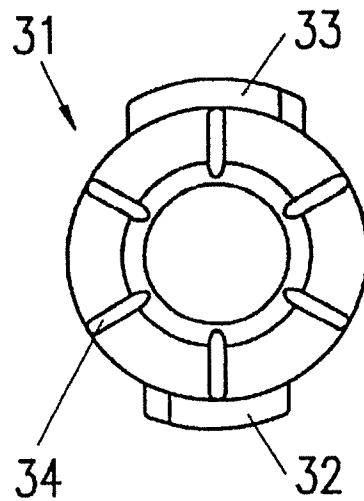
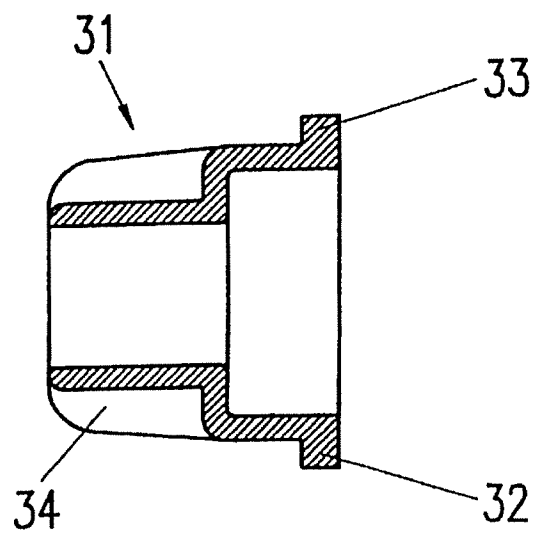


FIG. 12



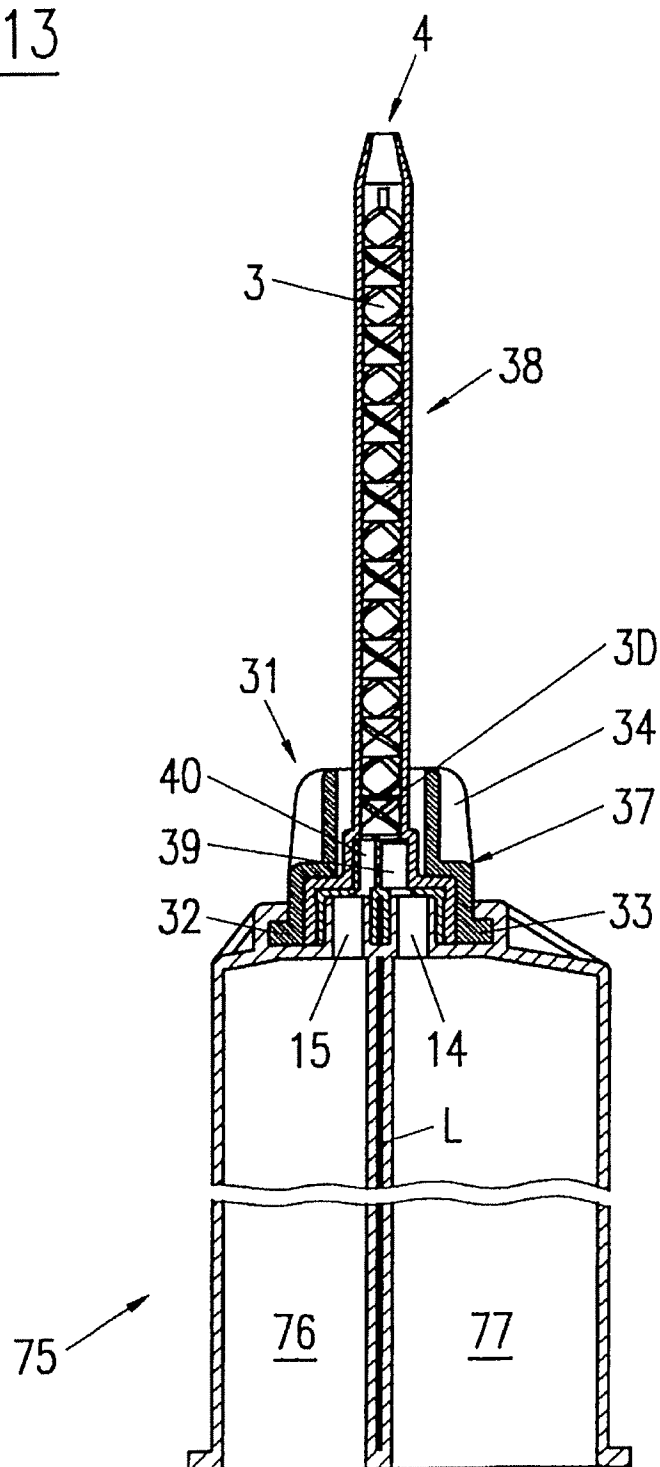
U.S. Patent

Feb. 13, 2001

Sheet 8 of 30

US 6,186,363 B1

FIG. 13



U.S. Patent

Feb. 13, 2001

Sheet 9 of 30

US 6,186,363 B1

FIG. 14

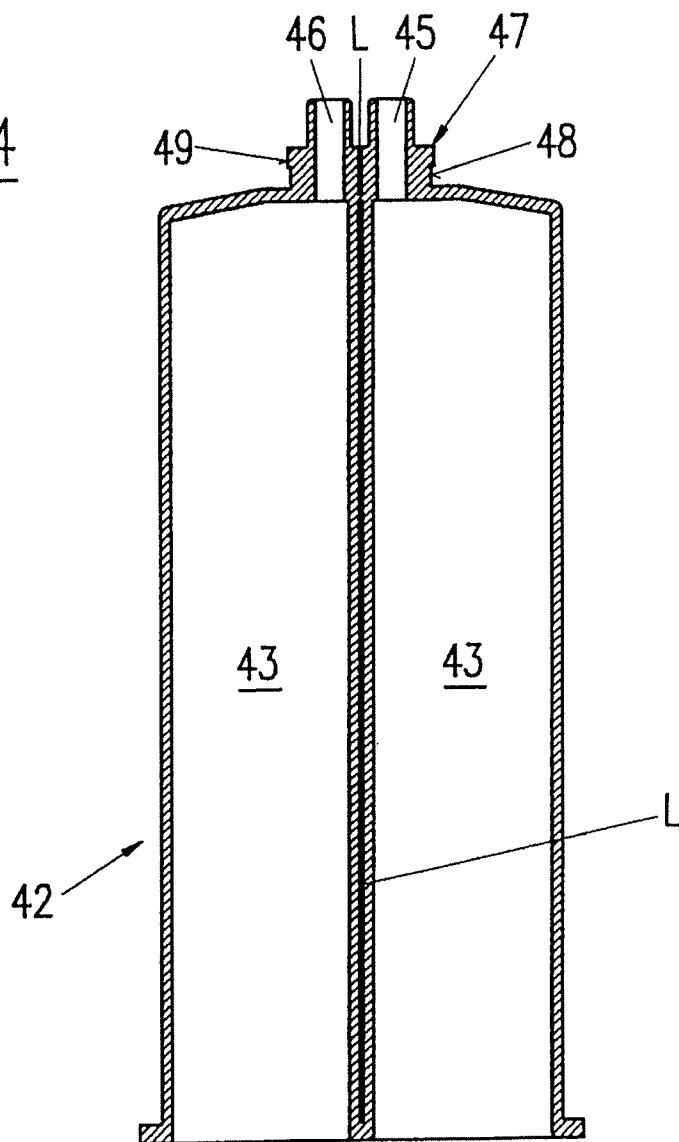
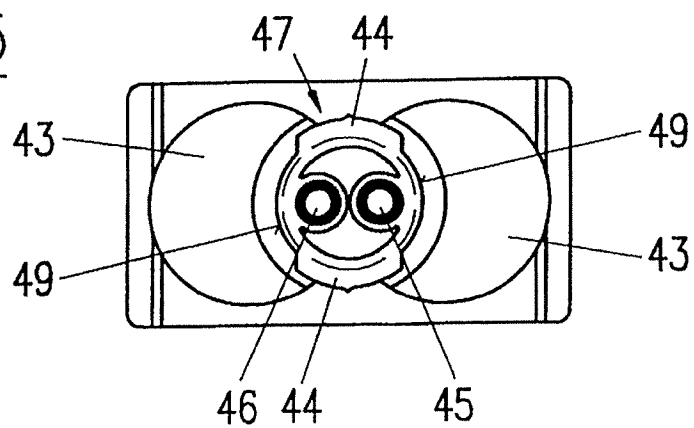


FIG. 15



**U.S. Patent**

Feb. 13, 2001

Sheet 10 of 30

**US 6,186,363 B1**

FIG. 16A

FIG. 16B

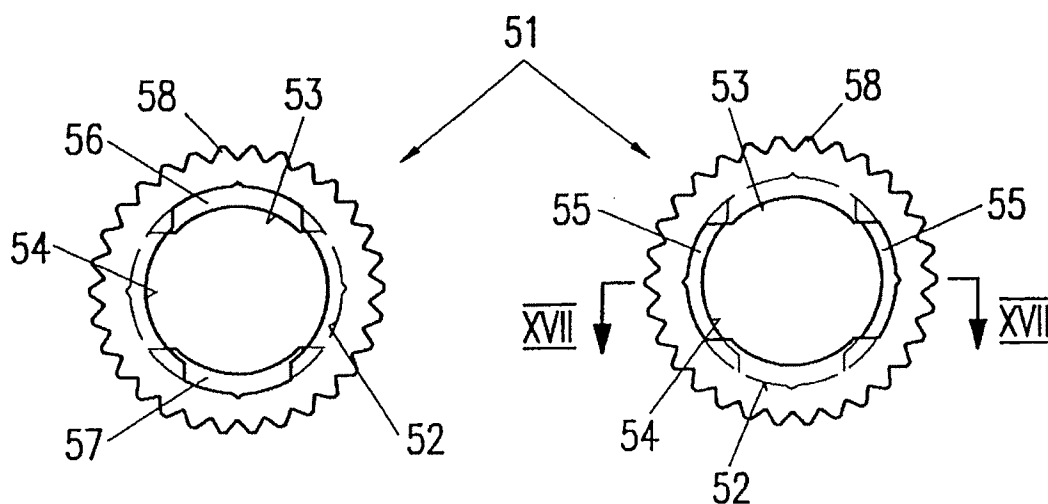


FIG. 17

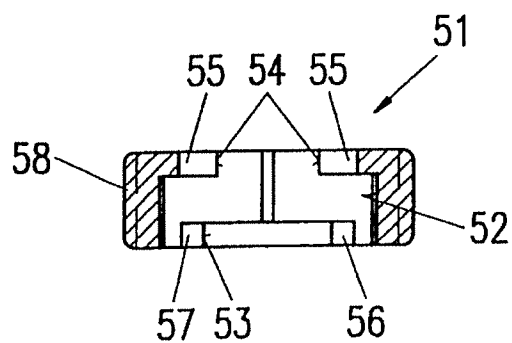


FIG. 18

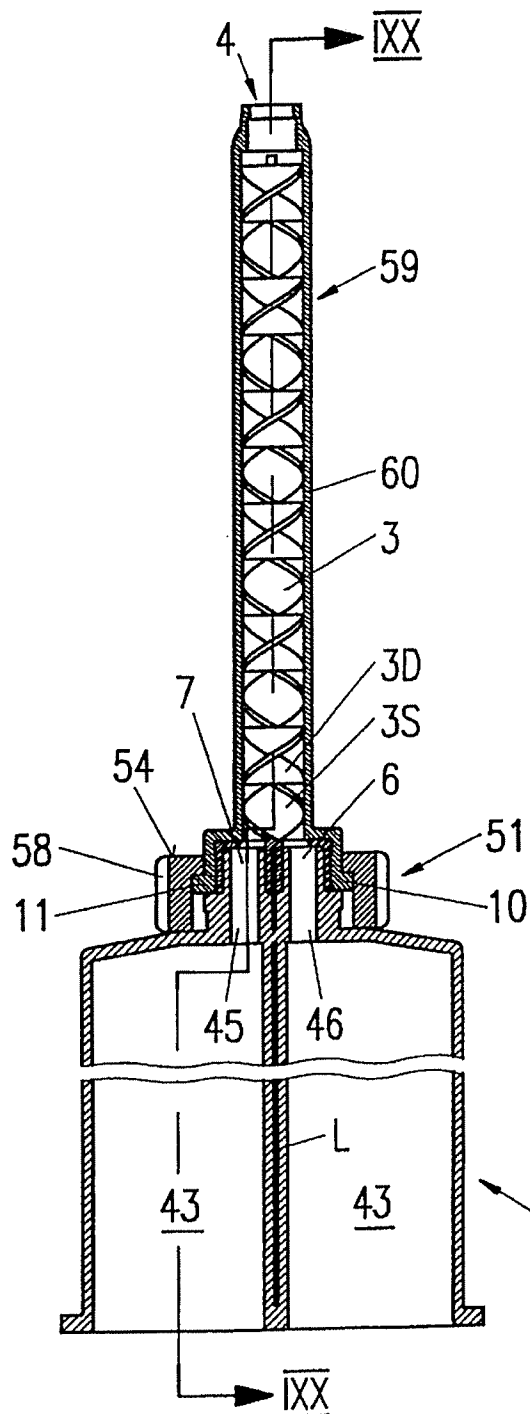
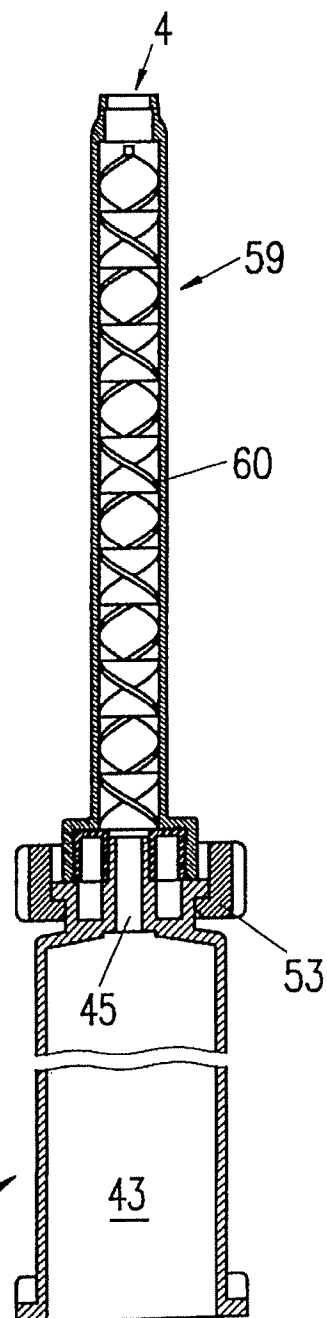


FIG. 19



U.S. Patent

Feb. 13, 2001

Sheet 12 of 30

US 6,186,363 B1

FIG. 20

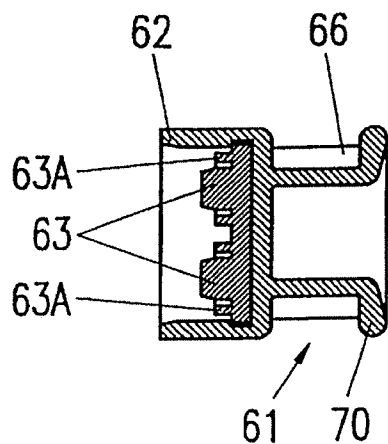


FIG. 21

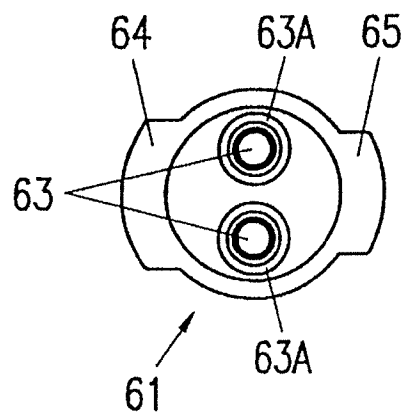


FIG. 22

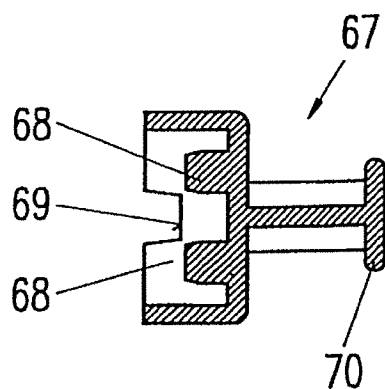
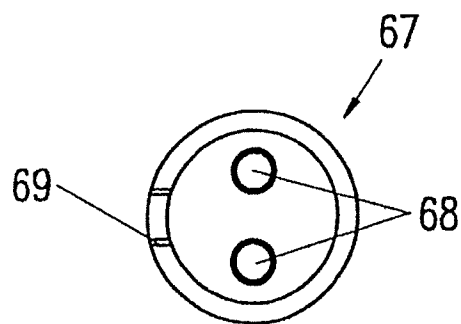


FIG. 23





U.S. Patent

Feb. 13, 2001

Sheet 13 of 30

US 6,186,363 B1

FIG. 24

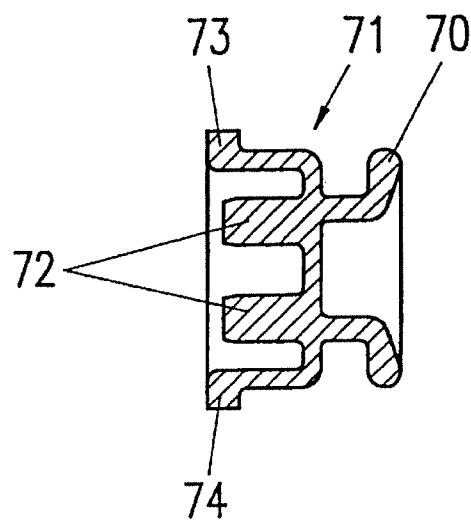
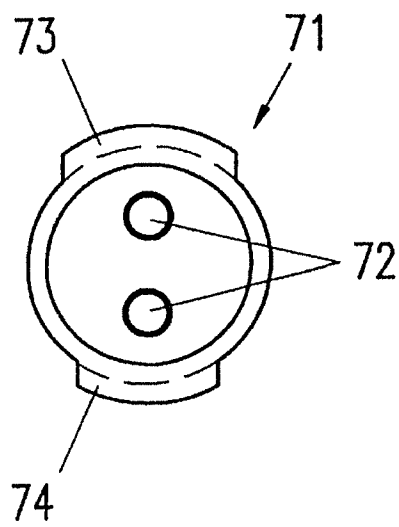


FIG. 25



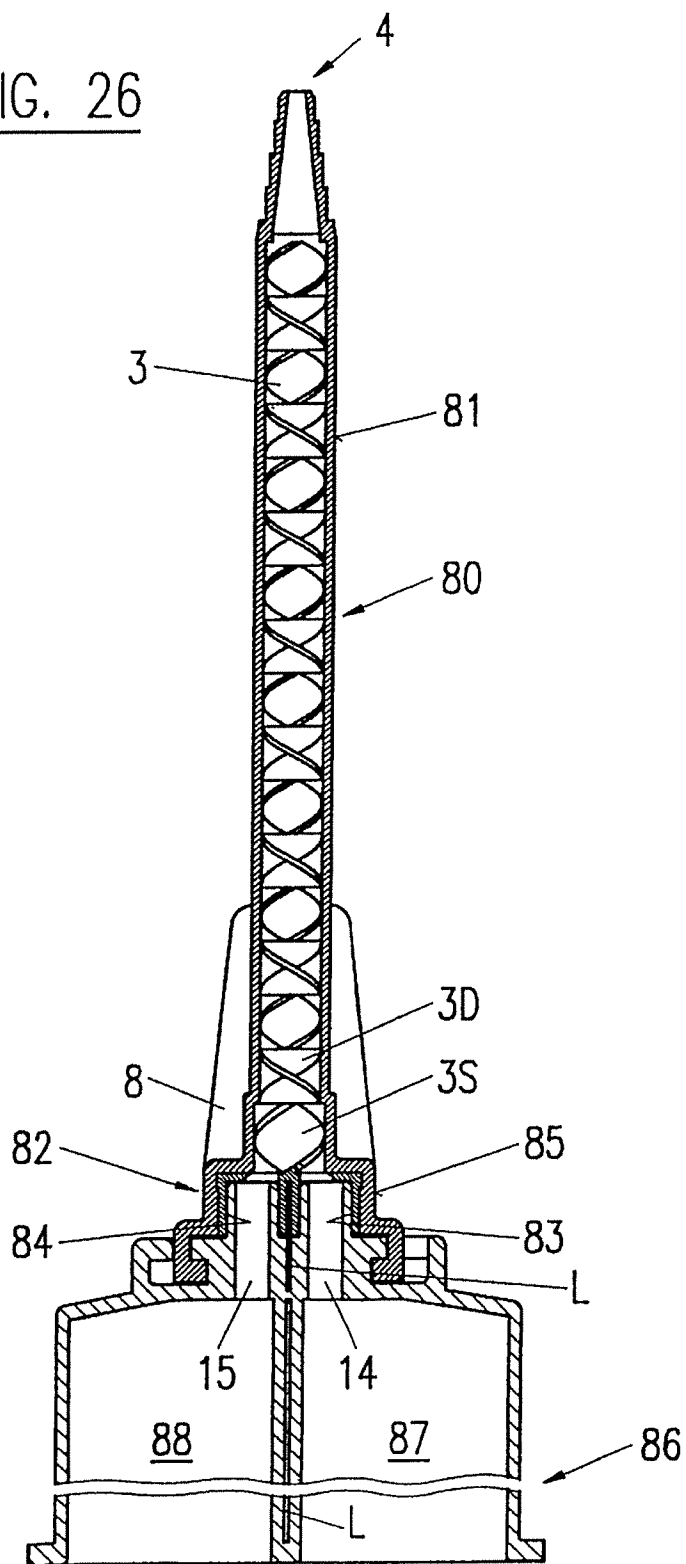
U.S. Patent

Feb. 13, 2001

Sheet 14 of 30

US 6,186,363 B1

FIG. 26



U.S. Patent

Feb. 13, 2001

Sheet 15 of 30

US 6,186,363 B1

FIG. 27

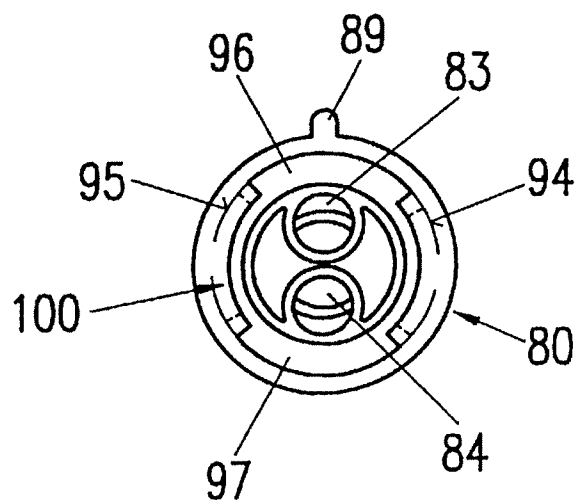
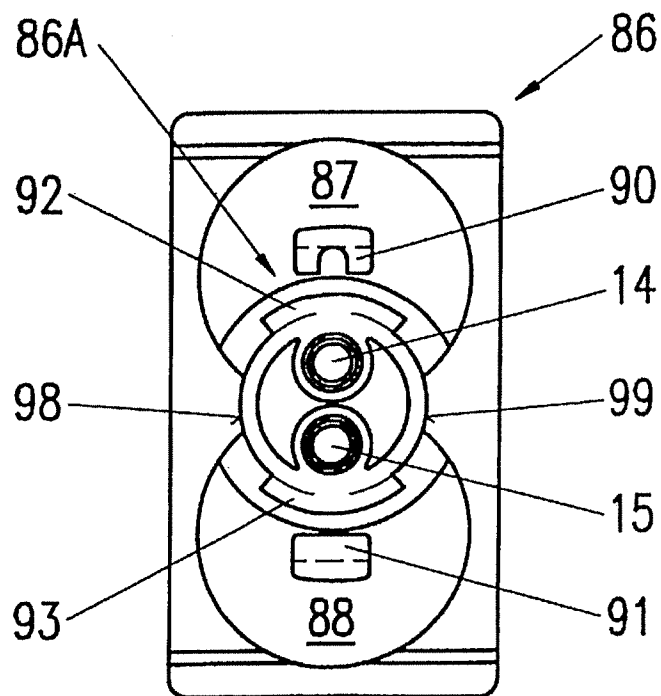


FIG. 28



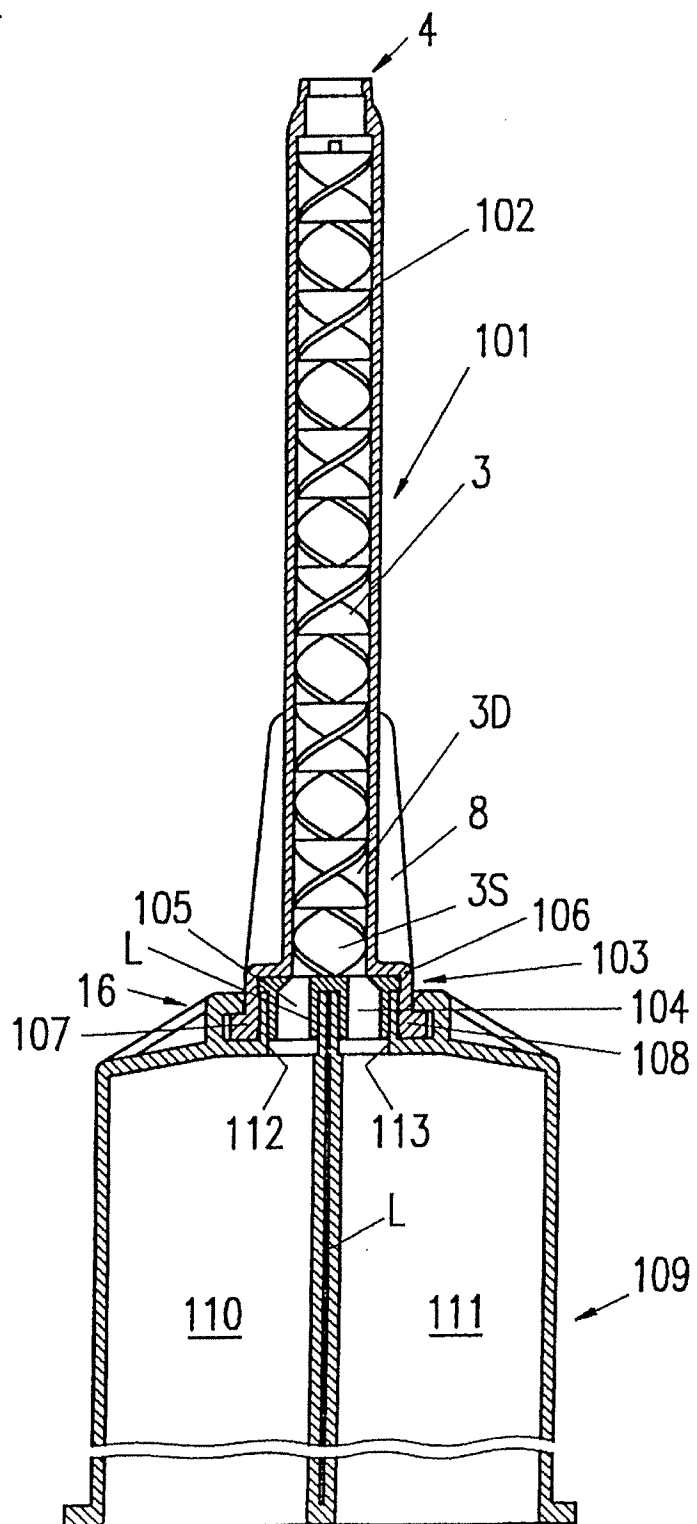
U.S. Patent

Feb. 13, 2001

Sheet 16 of 30

US 6,186,363 B1

FIG. 29



U.S. Patent

Feb. 13, 2001

Sheet 17 of 30

US 6,186,363 B1

FIG. 30

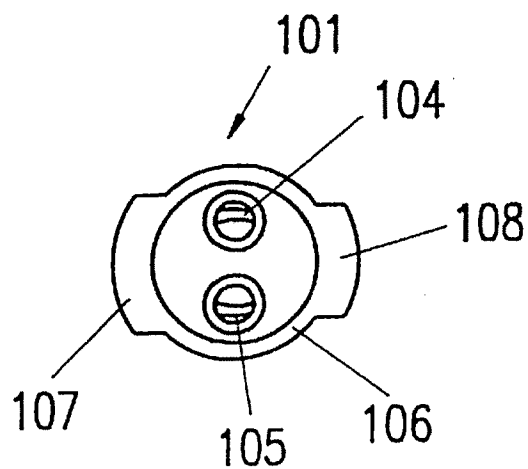
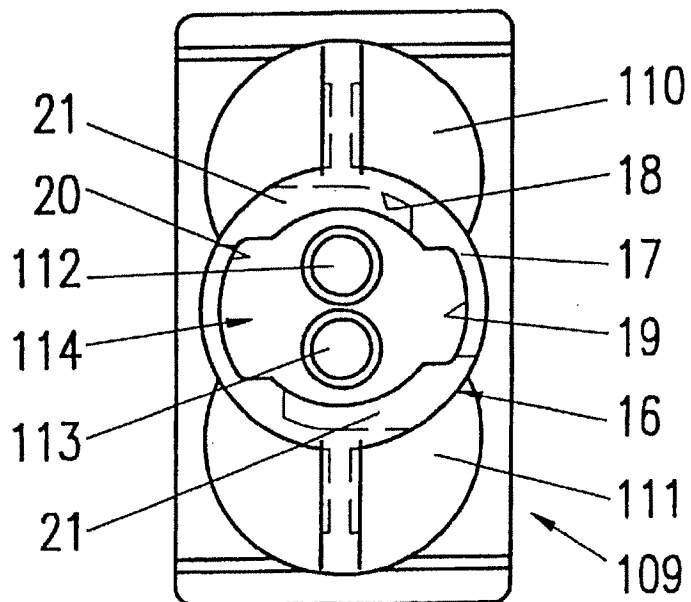


FIG. 31



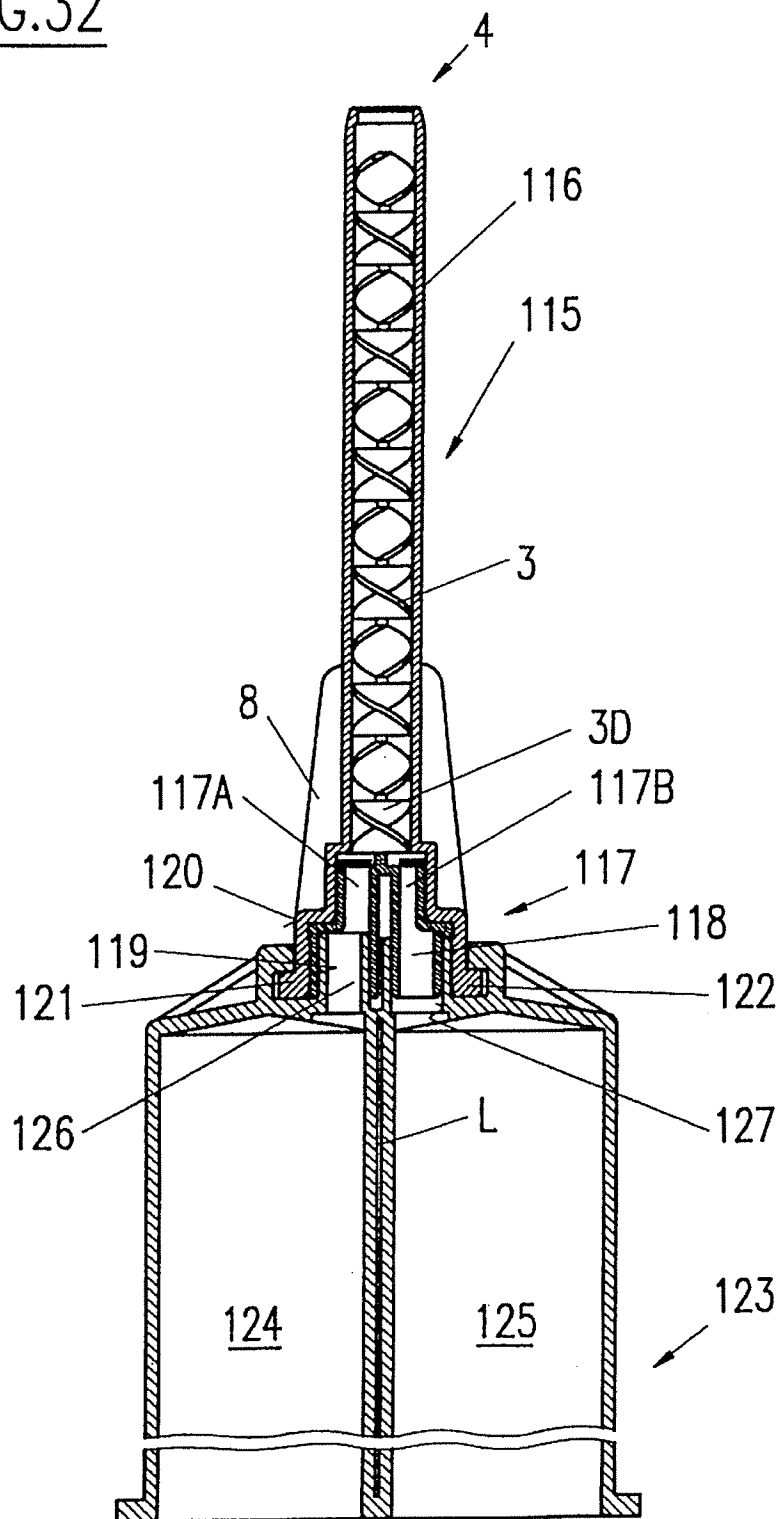
U.S. Patent

Feb. 13, 2001

Sheet 18 of 30

US 6,186,363 B1

FIG.32



U.S. Patent

Feb. 13, 2001

Sheet 19 of 30

US 6,186,363 B1

FIG. 33

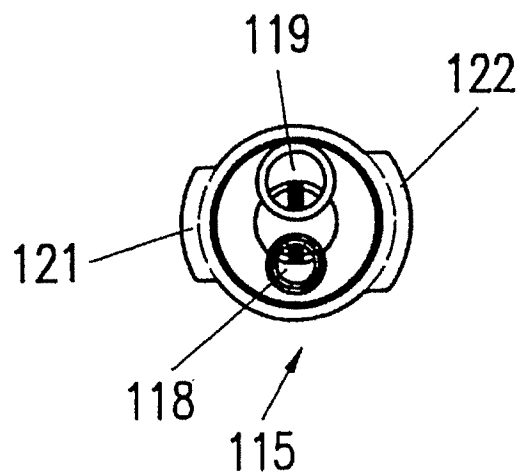
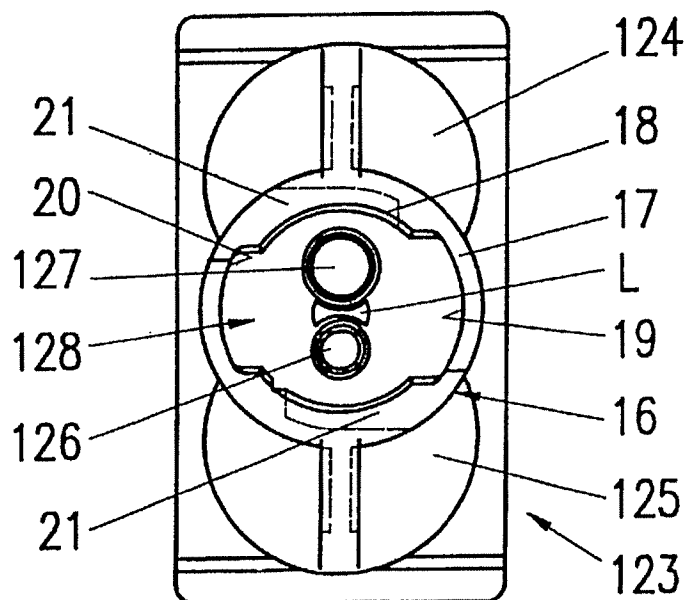


FIG. 34



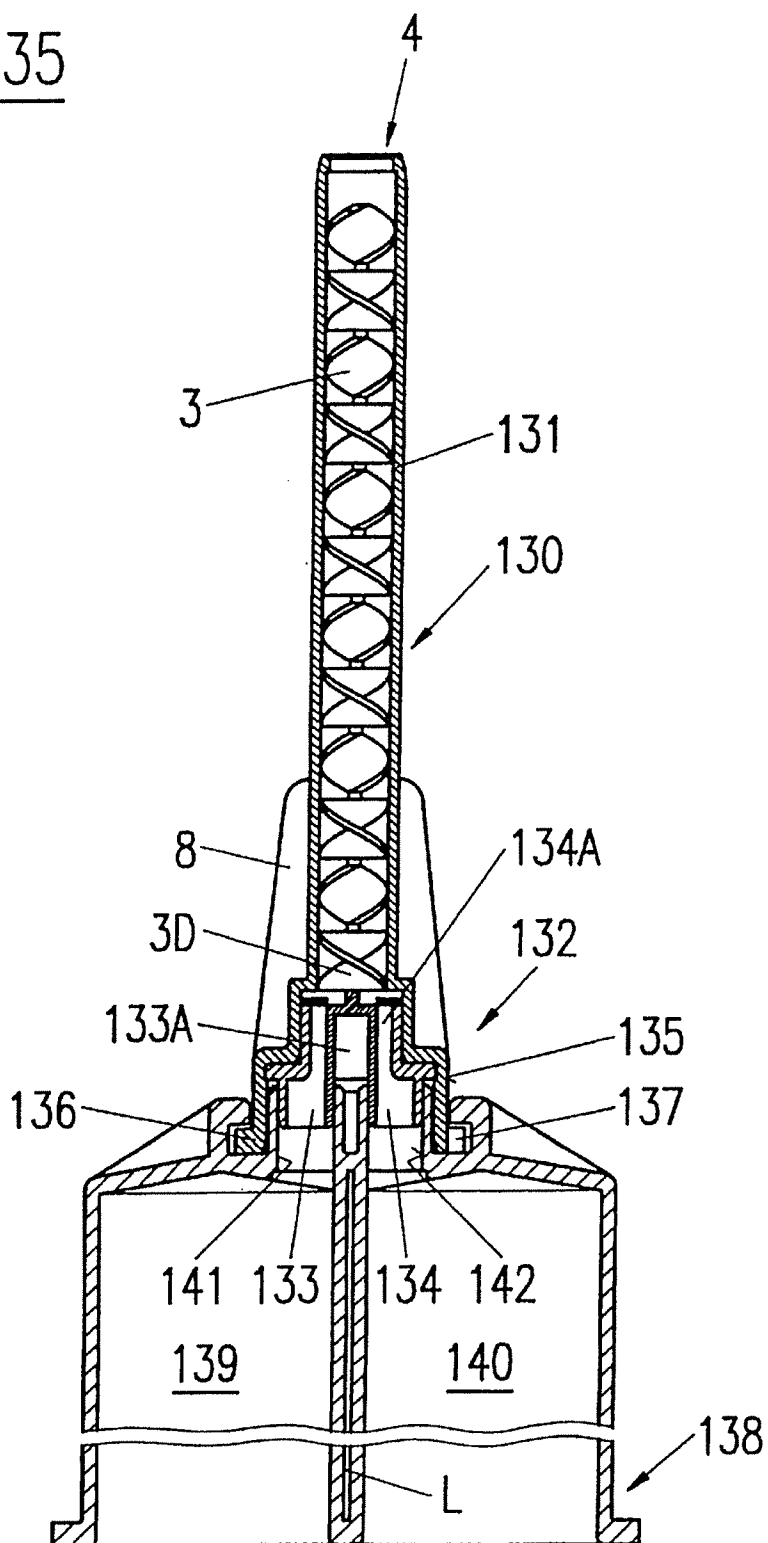
U.S. Patent

Feb. 13, 2001

Sheet 20 of 30

US 6,186,363 B1

FIG. 35





U.S. Patent

Feb. 13, 2001

Sheet 21 of 30

US 6,186,363 B1

FIG. 36

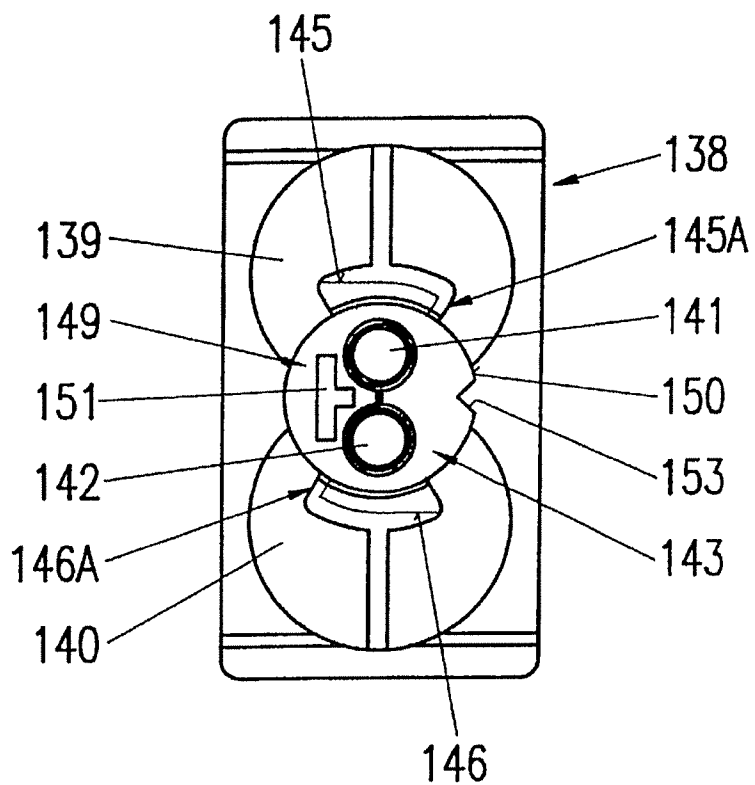


FIG. 37

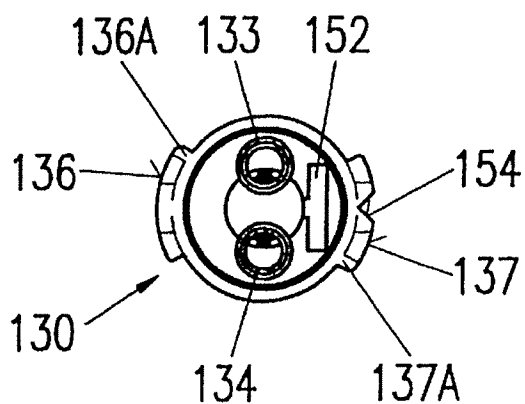
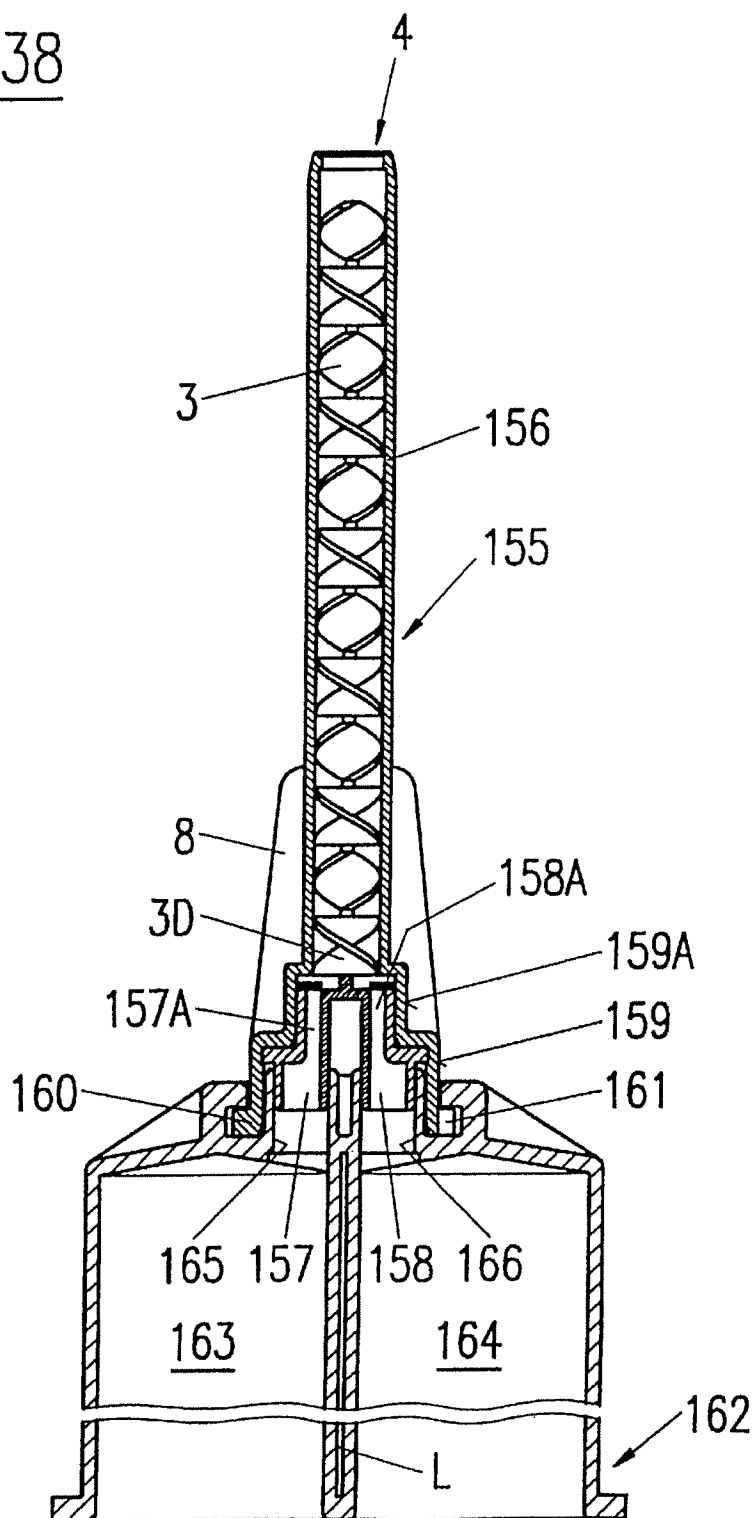


FIG. 38



U.S. Patent

Feb. 13, 2001

Sheet 23 of 30

US 6,186,363 B1

FIG. 39

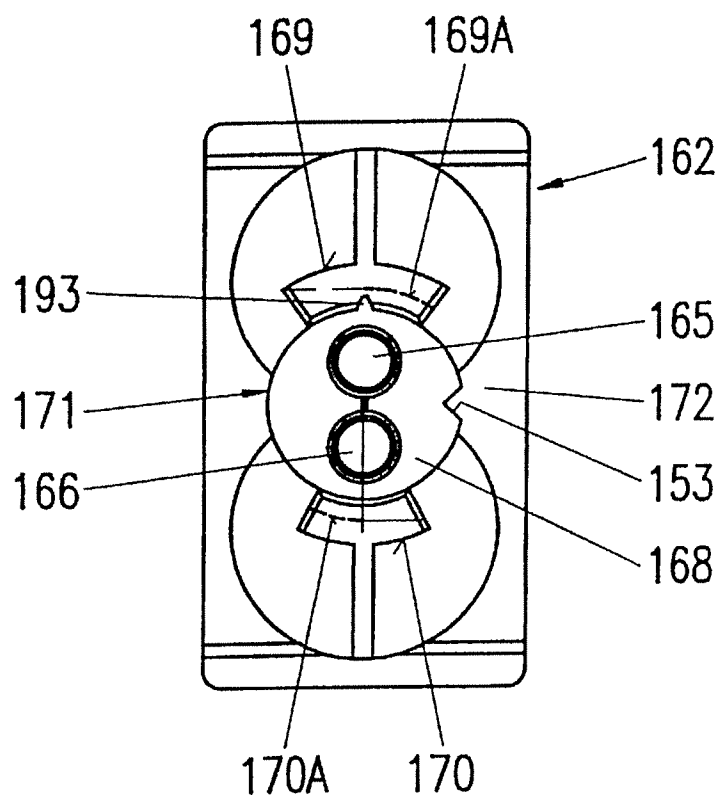
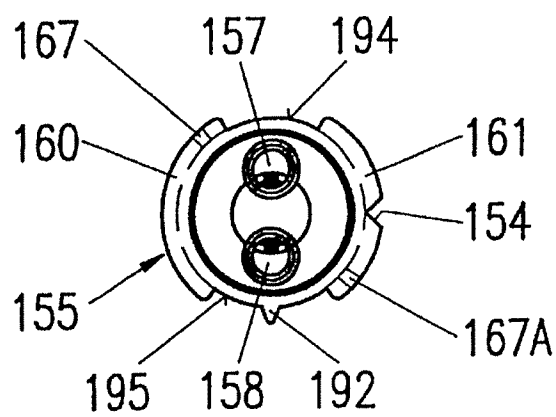


FIG. 40



U.S. Patent

Feb. 13, 2001

Sheet 24 of 30

US 6,186,363 B1

FIG. 41

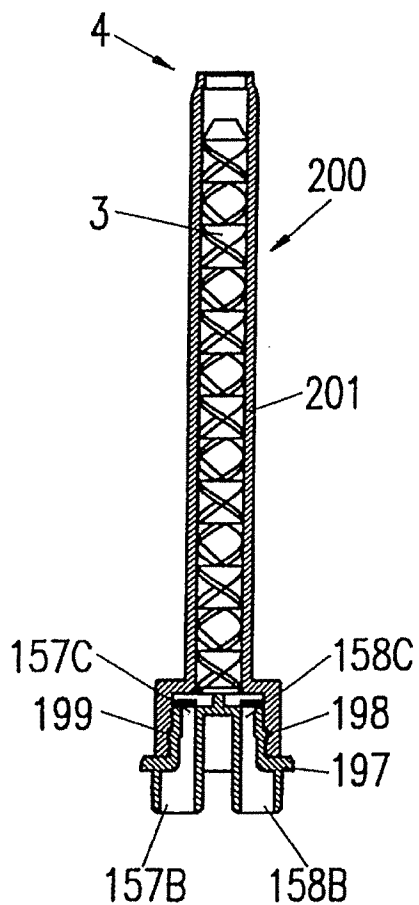


FIG. 42

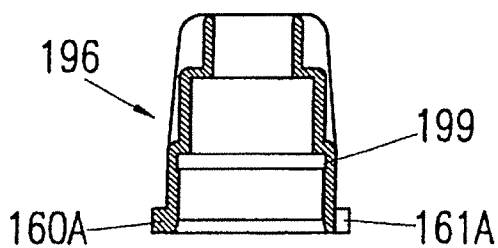
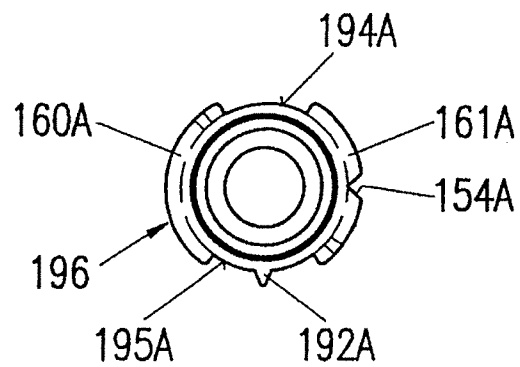


FIG. 43



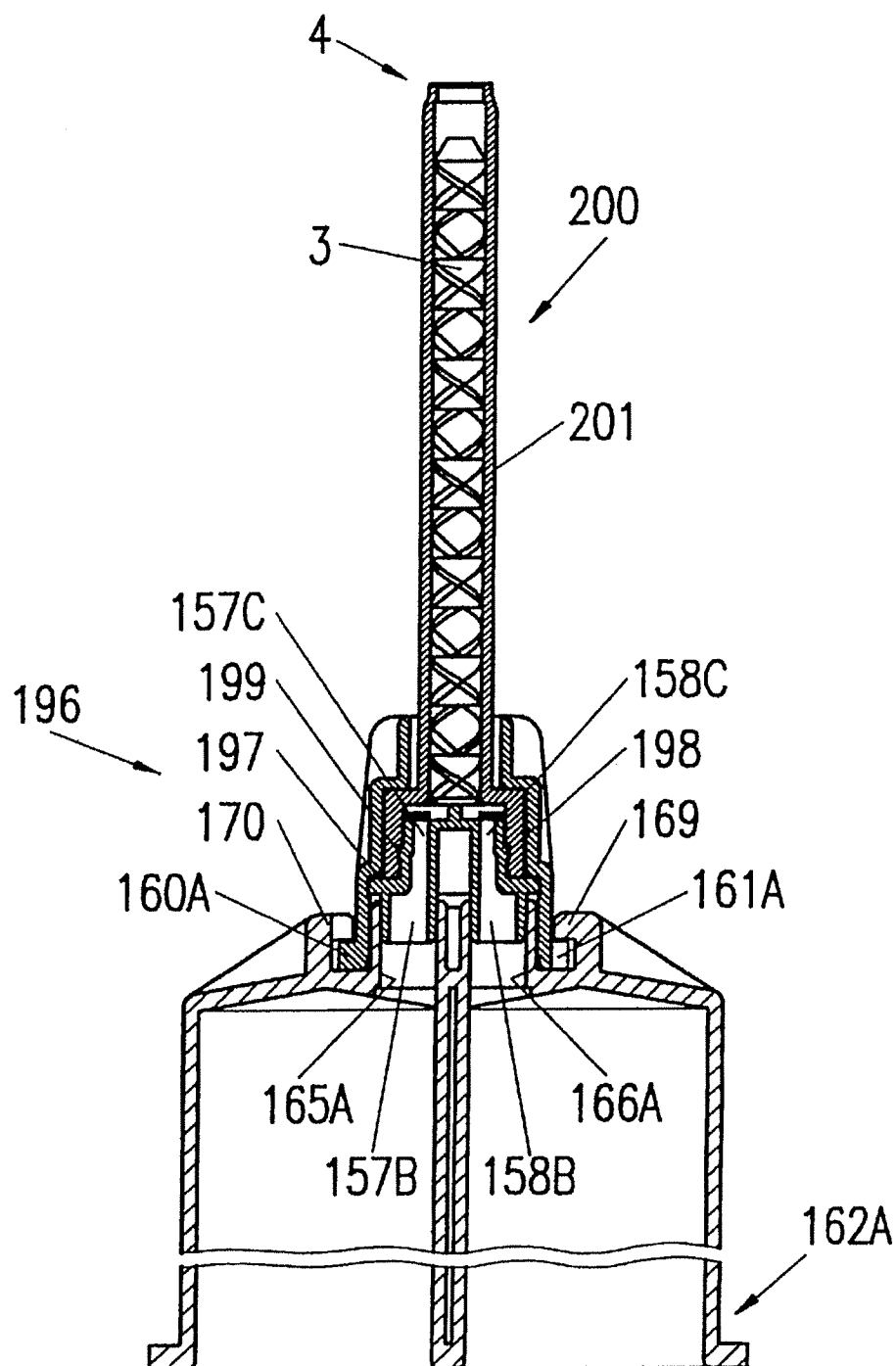
U.S. Patent

Feb. 13, 2001

Sheet 25 of 30

US 6,186,363 B1

FIG. 44



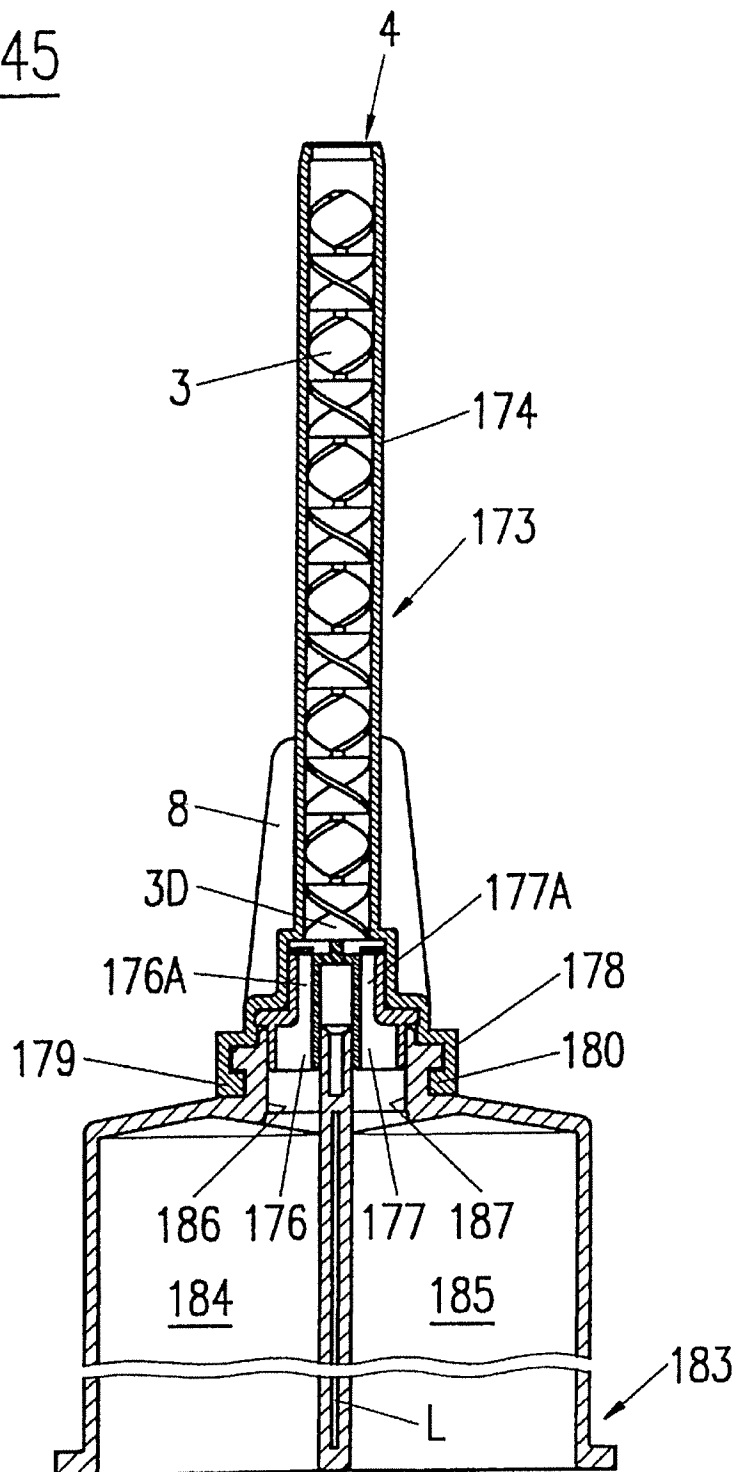
U.S. Patent

Feb. 13, 2001

Sheet 26 of 30

US 6,186,363 B1

FIG. 45



U.S. Patent

Feb. 13, 2001

Sheet 27 of 30

US 6,186,363 B1

FIG. 46

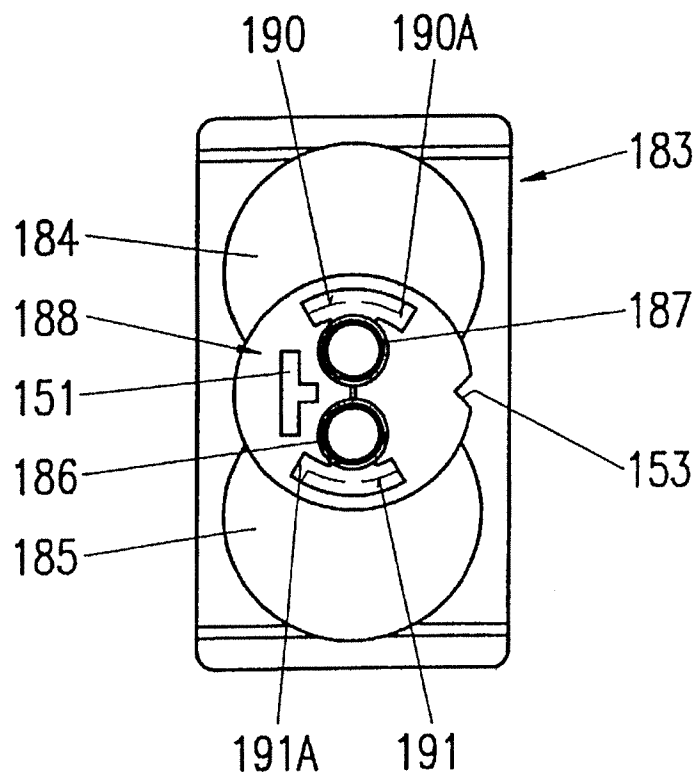
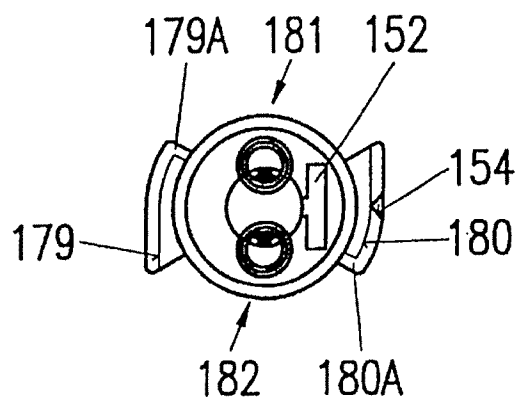


FIG. 47



U.S. Patent

Feb. 13, 2001

Sheet 28 of 30

US 6,186,363 B1

FIG. 48

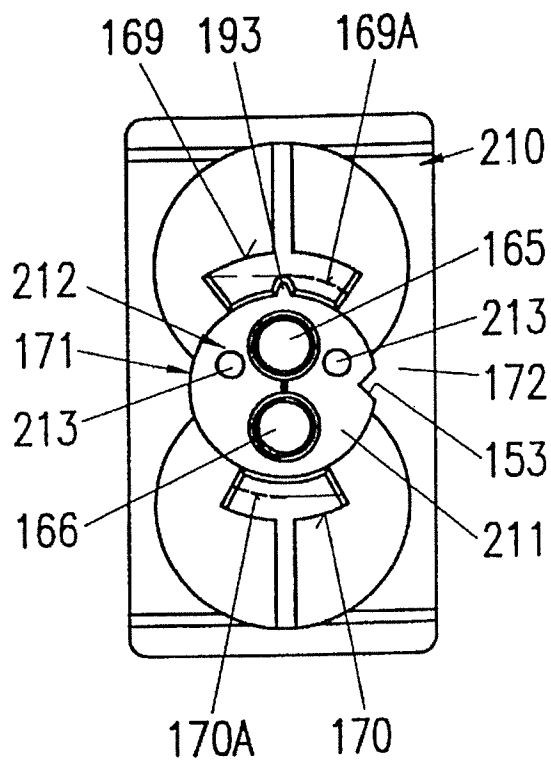


FIG. 50

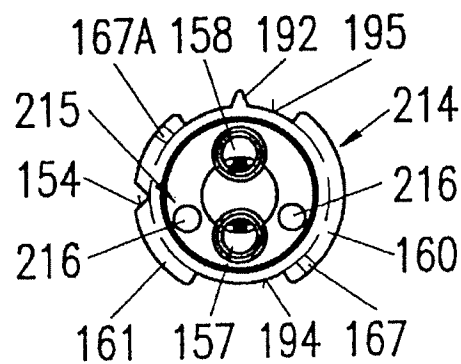
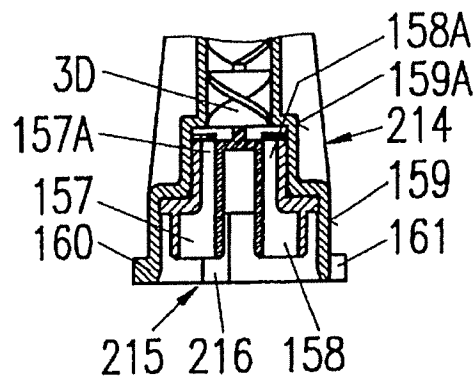


FIG. 49





**U.S. Patent**

Feb. 13, 2001

Sheet 29 of 30

**US 6,186,363 B1**

FIG. 51

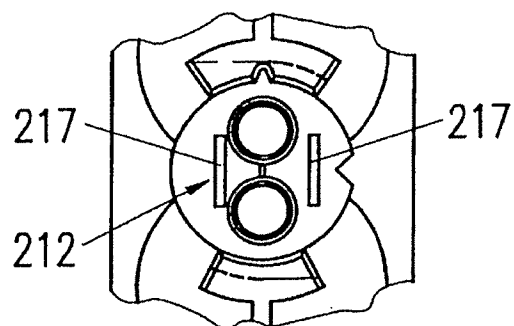


FIG. 52

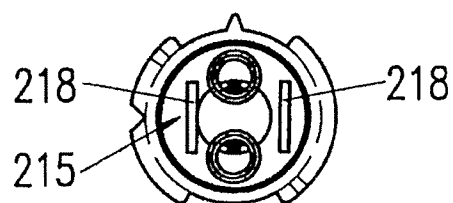


FIG. 53

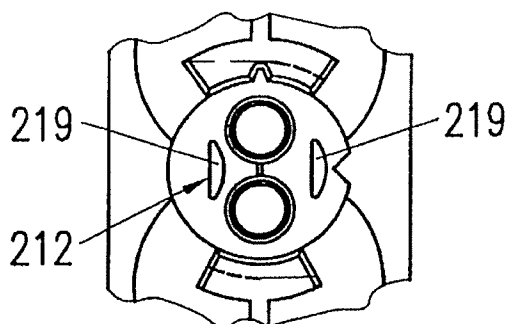


FIG. 54

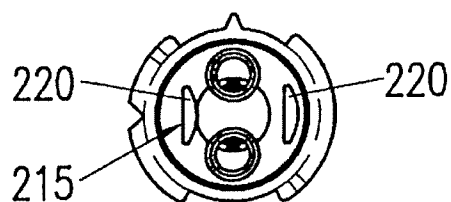


FIG. 55

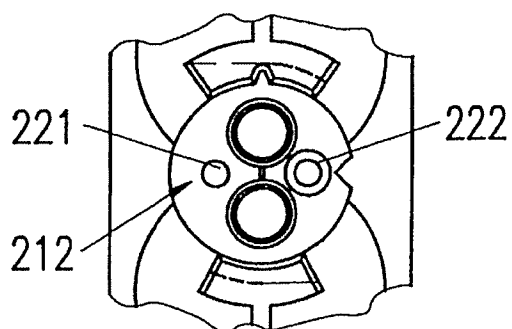
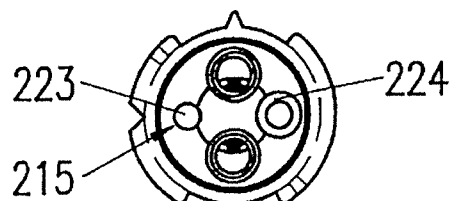


FIG. 56



**U.S. Patent**

Feb. 13, 2001

Sheet 30 of 30

**US 6,186,363 B1**

FIG. 57

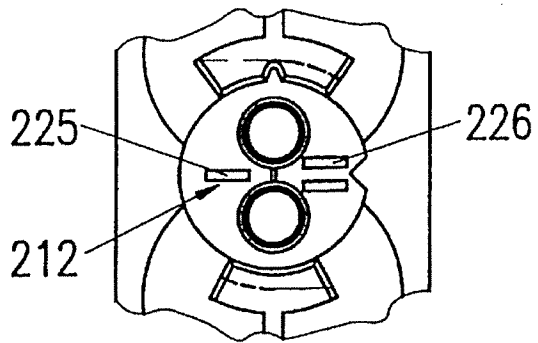
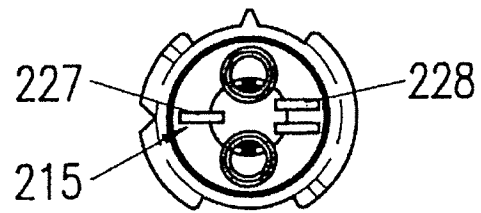


FIG. 58



US 6,186,363 B1

1

# **BAYONET FASTENING DEVICE FOR THE ATTACHMENT OF AN ACCESSORY TO A MULTIPLE COMPONENT CARTRIDGE OR DISPENSING DEVICE**

## **CROSS-REFERENCE TO RELATED APPLICATIONS**

The present application is a continuation of patent application Ser. No. 08/563,109, filed Nov. 27, 1995, now U.S. Pat. No. 5,918,772, which is a continuation in part of patent application Ser. No. 08/403,172 filed Mar. 13, 1995, now abandoned, and a continuation in part of patent application Ser. No. 08/522,109 filed Aug. 31, 1995 now abandoned.

## **BACKGROUND OF THE INVENTION**

The present invention relates to a bayonet fastening device for the attachment of an accessory to a dispensing device, in particular for the attachment of a mixer to a two-component cartridge.

There exists a great number of mixers and cartridges having means for attaching the mixer to the cartridge for example, U.S. Pat. Nos. 4,767,026 and 4,538,920 disclose on mixer that has two bayonet locking lugs inserted into corresponding prongs on the cartridge by rotation. On one hand, the rotary locking movement of the complete mixer will cause contamination of one chemical component against the other chemical component at the interface between the cartridge and the mixer, in that these components will be transported from one outlet to the other outlet, from one inlet to the other inlet, causing an undesired reaction between these chemical components at the interface between cartridge and mixer or closure means, and eventually carrying such a reaction back into the cartridge outlets, thus causing plugging of the outlets. On the other hand there exist situations where it is necessary to connect and attach the mixer or accessory to a multiple component cartridge or dispensing device in a predetermined position, such as when cartridge outlets or mixer inlets are of a different size for different relative mixing ratios or when mixers or accessories are refitted for reuse.

There exists a need to connect and attach a mixer or accessory to a multiple component cartridge or dispensing device in a predetermined orientation, such as when cartridge outlets or mixer inlets are of a different size for different relative mixing ratios or when special high ratio mixers are used for greater mixing efficiency and when mixers or accessories are refitted for reuse. In the latter case of reuse, it is necessary to avoid any possibility of cross contamination of one chemical component against another during refitting. Such cross contamination of reactive chemical systems can cause plugging at the cartridge outlets and cause a reaction back into and within the cartridge.

U.S. Pat. No. 5,228,599 discloses a multiple dispensing cartridge having a mixer attached thereto with the aid of a coupling nut having an internal thread, wherein each storage cylinder ends in a dispensing opening which forms a side by side outlet, whereas the inlet of the mixer is not defined. The mixer is put on the cartridge and secured by a coupling nut via an external thread at the cartridge.

Another cross contamination situation can occur when a clean mixer or accessory inlet area or closure plugs are able to make any form of incorrect alignment contact, such as by angular tipping, with the chemical components at the cartridge outlet area during the process of initial placing of the mixer or closure plugs against the cartridge in preparation for attachment. In that case, when fitting the same mixer or

2

closure plugs in the correct position, it is possible to now chemically contaminate the outlets of the cartridge. Again, this can cause plugging and a reaction back into and within the cartridge.

Additionally, it is commonly found in bayonet attachment means of the prior art that the bayonet prongs of the cartridge are relatively small and therefore of limited structural rigidity and strength. This allows the possibility of distortion and is of greater significance due to the trend towards smaller mixer diameters and therefore high backpressures, the result being leakage at the mixer to cartridge sealing interface during dispensing.

## **SUMMARY OF THE INVENTION**

On the basis of this prior art, it is an object of the present invention to provide for a bayonet attachment device for attaching a mixer, or closure means or any other accessory, such as an adapter or a connecting tube to a multiple component dispensing device, in particular a two component cartridge, which has improved strength and structural rigidity against stress caused by greater hydraulic forces due to the trend towards smaller mixer diameters as well as providing improved interface sealing.

This object is attained with a device wherein said bayonet attachment means at the dispensing apparatus or cartridge is formed as ring-shaped bayonet socket, with at least two internal recesses or an inner circular groove with at least two bayonet cutout followed by adjacent bayonet retaining means, and wherein the bayonet attachment means of the accessory comprises at least two bayonet lugs corresponding to the cut outs.

It is another object of the invention that alignment of the accessory inlets to the cartridge outlets takes place in one position only to avoid cross contamination. This object is attained with a device wherein said bayonet attachment means at the dispensing apparatus or cartridge and at the accessory have means for coded alignment of the accessory to the dispensing apparatus or cartridge.

Other objects and improvements of the device are defined in the dependent claims.

## **BRIEF DESCRIPTION OF THE DRAWINGS**

The invention will be explained in more detail hereinafter with reference to a drawing of embodiments.

FIGS. 1-6 show a first embodiment of the invention with a rotatable mixer housing, wherein

FIG. 1 is a longitudinal section of a mixer,

FIG. 2 is a view of the inlet end of the mixer,

FIG. 3 is a longitudinal section of a cartridge,

FIG. 4 is a top view of the cartridge of FIG. 3 with distanced outlets and ring-shaped bayonet means,

FIG. 5 is a longitudinal section of a cartridge having two containers with different cross-sectional areas,

FIG. 6 is a top view of the cartridge of FIG. 5 with distanced outlets and ring-shaped bayonet means.

FIGS. 7-13 show a second embodiment of the invention comprising a coupling ring, wherein

FIG. 7 is a longitudinal section of a mixer,

FIG. 8 is a view of the inlet end of the mixer,

FIG. 8a is a view of an inlet end of the mixer according to an embodiment in which the inlets have different sizes,

FIG. 9 is a longitudinal section of a cartridge with distanced outlets and ring-shaped bayonet means,

US 6,186,363 B1

3

FIG. 9a is a detailed view of a cartridge with distanced outlets of different size,

FIG. 10 is a top view of the cartridge of FIG. 9 with a nose piece,

FIG. 11 is a top view of a coupling ring,

FIG. 12 is a section of the coupling ring of FIG. 11,

FIG. 13 is a longitudinal section of a variant of the mixer of FIG. 7 and 8 attached to the cartridge of FIGS. 5 and 6 having containers with different cross-sectional area.

FIGS. 14–19 show a third embodiment of the invention with a locking ring permanently attached to the cartridge, wherein

FIG. 14 is a longitudinal section of a cartridge with distanced outlets,

FIG. 15 is a top view of the cartridge of FIG. 14,

FIG. 16A is a view on the mixer side of a locking ring to be attached to the cartridge,

FIG. 16B is a view on the cartridge side of the locking ring of FIG. 16A,

FIG. 17 is a section of the locking ring according to the line XVII—XVII of FIG. 16B,

FIGS. 18 and 19 show in two longitudinal sections at 90° to each other a mixer attached to the cartridge of FIG. 14 with the locking ring of FIGS. 16A–17, in the locked position.

FIGS. 20–25 show three embodiments of a closure cap for the cartridge, wherein

FIGS. 20–21 show as first embodiment a two part closure cap in a longitudinal section and a view on its cartridge side face,

FIGS. 22–23 show as second embodiment a one part closure cap for use with a coupling ring in a longitudinal section and a view on its cartridge side face.

FIGS. 24–25 show as third embodiment a one part closure cap for use with a locking ring attached to the cartridge in a longitudinal section and a view on its cartridge side face.

FIGS. 26–28 show an alternative embodiment of the invention with a ring-shaped bayonet socket at the rotatable mixer housing, wherein

FIG. 26 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 27 is a view of the inlet end of the mixer, and

FIG. 28 is a top view of the cartridge of FIG. 26.

FIGS. 29–31 show a further embodiment of the invention with a ring-shaped bayonet socket at the cartridge, wherein

FIG. 29 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 30 is a view of the inlet end of the mixer, and

FIG. 31 is a top view of the cartridge of FIG. 29.

FIGS. 32–34 show a further embodiment of the invention with a ring-shaped bayonet socket at the cartridge, wherein

FIG. 32 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 33 is a view of the inlet end of the mixer, and

FIG. 34 is a top view of the cartridge of FIG. 32.

FIGS. 35–37 show a further embodiment of the invention with a sector-shaped bayonet socket at the cartridge, wherein

FIG. 35 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 36 is a top view of the cartridge of FIG. 35, and

4

FIG. 37 is a view of the inlet end of the mixer.

FIGS. 38–40 show an alternative embodiment of the invention with a sector-shaped bayonet socket at the cartridge, wherein

FIG. 38 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 39 is a top view of the cartridge of FIG. 38, and

FIG. 40 is a view of the inlet end of the mixer.

FIGS. 41–44 show a further embodiment of the invention with a coupling ring, wherein

FIG. 41 is a longitudinal section of a mixer,

FIG. 42 is a longitudinal section of a coupling ring,

FIG. 43 is a top view of the coupling ring of FIG. 42, and

FIG. 44 is a longitudinal section of the mixer attached to a partially shown cartridge via the coupling ring.

FIGS. 45–47 show a further embodiment of the invention with a sector-shaped bayonet socket at the mixer, wherein

FIG. 45 is a longitudinal section of a mixer attached to a partially shown cartridge,

FIG. 46 is a top view of the cartridge of FIG. 41, and

FIG. 47 is a view of the inlet end of the mixer.

FIGS. 48–58 show several further coding means at both the cartridge and the mixer for preventing cross-contamination by erroneous attachment of the mixer onto the cartridge, wherein

FIG. 48 is a top view of a cartridge like in FIG. 39, with additional coding means,

FIG. 49 is a section of the inlet end of a mixer like in FIG. 38, with additional coding means,

FIG. 50 is a view of the inlet end of the mixer of FIG. 49.

FIGS. 51 and 52 show a variant of the coding means at the cartridge and mixer.

FIGS. 53 and 54 show a further variant of the coding means at the cartridge and mixer.

FIGS. 55 and 56 show a further variant of the coding means at the cartridge and mixer.

FIGS. 57 and 58 show a further variant of the coding means at the cartridge and mixer.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIGS. 1–2 show a mixer 1 comprising a mixer housing 2, a mixer element group 3, the mixer outlet 4 and a mixer inlet section 5 with two separated inlet parts 6 and 7, which are integral with a properly aligned separating element 3S of the mixer element group 3. This mixer is attached to the cartridge by matching the mixer different width bayonet lugs 10, 11 to the different width bayonet sockets 19, 20 while pressing the mixer onto the cartridge and by rotating the mixer housing 2. The separated inlet parts 6 and 7 and the mixer element group 3 with the separating element 3S do not rotate. Separating element 3S serving in this embodiment as a separating means for guiding each chemical component separately to the first dividing element 3D of the mixer element group 3.

The mixer housing is provided with longitudinal ribs 8 that end at the larger diameter 9 of the mixer housing 2. The two lateral ends of the ribs are formed as bayonet lugs 10 and 11 cooperating with the bayonet retaining means of the cartridge. As follows from FIG. 2, the two lugs do not have the same width, lug 10 being larger than lug 11. As will be shown later, the different width of the lugs enable a coded alignment and attachment of the mixer to the cartridge.

US 6,186,363 B1

5

The mixer element group 3 is connected to the separated inlet parts 6 and 7 and is disposed in such a way within the housing that the housing itself is rotatable around the mixer element group 3 with attached inlet parts 6 and 7, which are arranged at the inlet side of the first mixer element 3S serving in this embodiment as a separating means for guiding each component separately to the first dividing element 3D of the mixer element group 3.

In FIG. 3, the cartridge 12 comprises two cylindrical containers or chamber 13 of equal cross-sectional areas for a 1:1 metering ratio ending in two individual, separate cylindrical and distal outlets 14 and 15. The outside shapes of the distal outlets 14 and 15 of the cartridge correspond to the respective inside shapes of the separate inlets 6 and 7 of the mixer, (see FIG. 1) whereby the inlets of the mixer fit over the outlets of the cartridge for tightly sealed connections. A reverse arrangement, where the inlet parts 6 and 7 fit into the outlet openings 14 and 15 is also possible.

In FIG. 4, the bayonet means 16 at the cartridge comprises a ring-shaped bayonet socket 17 with two internal recesses 18 and a circular opening with two diametrically opposed different width bayonet cutouts 19 and 20 for receiving the corresponding different width bayonet lugs 10 and 11, (see FIG. 1), of the mixer, allowing coded introduction of the mixer in one predetermined position only. The flange parts 21 adjacent to the cutouts serve as bayonet retaining means for securing the lugs of the mixer.

The ring-shaped bayonet means provides, in particular, for increased strength of the bayonet retaining means and increased structural rigidity of the outlet end of the cartridge when, during dispensing, the hydraulic forces transmitted from the attached mixer are at a maximum. This arrangement is a substantial improvement in comparison with the prior art bayonet prongs.

FIGS. 5 and 6 show a variant to the embodiment shown in FIGS. 1-4 in that the containers 22 and 23 of cartridge 24 have different cross-sectional areas for metering ratios other than 1:1.

In both described cases, in order to attach the mixer to the cartridge, the mixer can only be aligned with its bayonet lug widths corresponding to the different width cut outs of the bayonet sockets, then pressed onto the cartridge such that when the mixer is in place and the outlets and inlets are connected, the mixer housing 2 is rotated by 90° for the engagement of the bayonet lugs 10, 11 in the bayonet retaining means 21 of the cartridge. This attachment method prevents contamination of one component by the other at the mixer-cartridge interface yet enabling a quick coded attachment of the mixer.

FIGS. 7 and 8 show in a second embodiment a mixer 25 comprising a mixer housing 26, a mixer element group 3, a mixer outlet 4, and a mixer inlet section 27. This mixer is fixed to the cartridge 35 (see FIG. 9) with the aid of a separate coupling ring (see FIGS. 11 and 12). The coupling ring 31 is provided with two bayonet lugs 32 and 33 corresponding to the bayonet cutouts 19, 20, respectively of the bayonet attachment means 16 at the cartridge. For better manual gripping, ribs 34 are provided on the outer cylindrical surface.

It follows in particular from FIG. 7 that the mixer inlet section 27 comprises two cylindrical, individual inlet openings 28, 29 at the inlet side face of the first mixer element 3S serving in this embodiment as a separating means for guiding each component separately to the first dividing element 3D of the mixer element group 3. A slot 30 provides for a coded alignment of the mixer in regard to a cartridge.

6

Cartridge 35 (see FIGS. 9 and 10) is the same as cartridge 1 of FIG. 1 with the exception that the bottom of the bayonet attachment means 16 comprises a nose piece 36 corresponding to the slot 30 at the mixer (see FIGS. 7 and 8), for coded alignment of the mixer.

When connecting the mixer to the cartridge, the nose piece 36 on the cartridge fits into slot 30 of the mixer inlet section 27. This coded connection method assures not only one alignment possibility but also axial mixer attachment without rotation of the mixer housing, thus preventing contamination of one component by the other at the cartridge/mixer interface.

There are other coding means possible at the dispensing apparatus or cartridge and at the accessory for the coded alignment of the accessory to the dispensing apparatus or cartridge, e.g. pins or protruding parts of all kind fitting into a recess or cavity or slot. The coding means may also take the form of differently shaped, similar or dissimilar sized inlets and outlets as described later in the specification.

FIG. 13 shows a mixer 38 attached to a cartridge 75 having containers 76 and 77 with different cross-sectional areas, as a variant to the embodiment shown in FIGS. 5-12 in that the mixer inlet section 37 of mixer 38 has a separating means within the mixer, which separating means comprises separated inlet chambers 39, 40, respectively having different cross-sectional areas, and lodged within a smaller combined diameter than the cartridge outlet with corresponding openings for each chamber for material to pass through.

The aforementioned separating means serves to maintain separation of the material flows up to the first dividing element 3D of the mixer element group 3. This separating means can have chambers with equal cross-sectional areas or have a cross-sectional area ratio other than 1:1. For example, the ratio of the cross-sectional areas of the separating chambers can be adapted to the cross-sectional areas of the containers 76 and 77 of cartridge 75, respectively to its metering ratio. The separating means is fixedly connected to the mixer element group 3.

The cartridge 75 has the same attaching means as in FIGS. 5 and 6, and the mixer 38 is attached to the cartridge by means of the coupling ring 31.

The third embodiment of the invention according to the FIGS. 14-19 comprises a locking ring 51 that is snapped onto and permanently attached to the cartridge 42. The cartridge 42 comprises two cylindrical containers or chambers 43 of equal cross-sectional area, two distal outlets 45 and 46, and an attaching means 47 for attaching the locking ring 51 and for limiting its rotational movement. The form of the attaching means 47 is a circular edge 49 with two lugs 44 of same width and arranged around the two distal outlets with a circular undercut 48 at its base.

The locking ring 51 (see FIGS. 16A and 16B) and 17, snaps over circular edge 49 of the attaching means of the cartridge and remains attached to it. The locking ring 51 has an inner circular groove 52 forming a cartridge side edge 53 and a mixer side edge 54. The cartridge side edge 53 has two opposed cutouts 55 the width of which corresponds to the lugs 44 of the attaching means whereby the inner diameter of the cartridge side edge 53 is slightly smaller than the outer diameter of the circular edge 49 of the attaching means of the cartridge. For snapping the locking ring to the cartridge, the ring is positioned so that the cutouts of its cartridge side edge are placed above the lugs of the attaching means and the ring is then pushed onto the cartridge so that the remaining cartridge side edge of the locking ring slides into the circular undercut 48 of the attaching means. The locking ring is also provided with a serration 58 for better manual gripping.



US 6,186,363 B1

7

The mixer side edge 54 has two opposite cutouts 56 and 57 of different width corresponding to the lugs 10 and 11 of the mixer for insertion in one position only. These two cutouts are arranged at 90° to the cutouts 55 of the cartridge side edge. Thus, when the mixer 59 is to be attached to the locking ring on the cartridge and the locking ring is rotated by 90°, the remaining inside flange parts of both the cartridge side edge and the mixer side edge serve as bayonet retaining means to encompass the mixer lugs 10 and 11 as well as the lugs 44 of the attaching means 47 of the cartridge for strong securement.

FIGS. 18 and 19 show cartridge 42 of FIG. 14 with a mixer 59, which is similar to mixer 1 of FIG. 1 with the same mixer inlet section 5 with separate female inlets 6 and 7, except that the housing 60 is not rotatable around the integral internal parts of the mixer and has no ribs 8, and the two bayonet lugs 10 and 11 are of different widths. FIG. 18 shows the mixer introduced within the locking ring 51 with the locking ring in its locked position and FIG. 19 shows a section along the line XIX—XIX in FIG. 18 of the same assembly at 90°. It is evident that a mixer with separated inlet chambers can be attached likewise and also that a cartridge may be one having containers with different cross-sectional areas as in FIG. 5.

The above described system of the coded attachment of the mixer also allows for the coded attachment of closure caps, adapters etc., thus preventing cross contamination and allowing closure cap re-use.

The first embodiment of a coded closure cap 61, FIGS. 20 and 21, consists of two parts. The insert 62 has two male plugs 63 for closing the outlets of a cartridge, for example the distanced outlets 14 and 15 of cartridge 12 of FIG. 3.

In this embodiment it is shown how the sealing effect of a plug at the cartridge outlet can be improved by providing the male plug 63 with a second rim 63A reaching over the female cartridge outlet. The provision of such a male plug with a circumferential rim is of course not limited to this example.

The rotatable attaching means has two bayonet lugs 64 and 65 of different widths corresponding to the lugs 10 and 11 of mixer 1 of FIG. 1. The outer surface of the cap is provided with ribs 66 and a collar 70 for better gripping. The coded attachment of the closure cap to cartridge 12 or 24 is analogous to the attachment of mixer 1.

The second embodiment, FIGS. 22 and 23, consists of a coded closure cap 67, which also has two plugs 68 for closing the outlets of a cartridge, for example the distanced male outlets 14 and 15 of cartridge 35 of FIG. 9, and a slot 69 similar to slot 30 at mixer 25 for coded cooperation with nose piece 36 of cartridge 35. The outer surface of the cap is also provided with a collar 70 for better manual gripping. The attachment of the cap to cartridge 35 is achieved with coupling ring 31 of FIG. 11, analogous to the attachment of mixer 25 to that cartridge.

The third embodiment of a coded closure cap 71, FIGS. 24 and 25, is similar to the second embodiment and comprises two plugs 72 for closing the distanced male outlets 45 and 46 of cartridge 42 of FIG. 14. FIG. 25 shows the cartridge side of the closure cap with two bayonet lugs 73, 74 of different width and diametrically opposed on the edge facing the cartridge. This closure cap is attached by means of the locking ring 51 of FIGS. 18 and 19 and is also provided with a collar 70 for better manual gripping.

The ring-shaped bayonet attachment means of the cartridge ensures a better stability of its outlet area and stronger retaining of the bayonet lugs compared with prior art bayonet attachment means.

8

In the case of utilizing the advantages of the ring-shaped bayonet socket alone and without the need for coded attachment, the bayonet lugs 10 and 11, 32 and 33, 64 and 65 at the mixer or closure cap or accessory as well as the corresponding bayonet cutouts 19 and 20 at the retaining means at the cartridge or 56 and 57 at the locking ring 51, may have the same widths. This applies also in the case when more than two lugs and corresponding cutouts are used, for example three or four respectively.

The FIGS. 26–28 show a further embodiment of the invention with an inverse bayonet arrangement as compared with those of the bayonet arrangement of the mixer and cartridge according to FIGS. 1–4. FIG. 26 shows a mixer 80 comprising a mixer housing 81 with mixer outlet 4 and a mixer inlet section 82 containing two separated inlet parts 83 and 84 followed by a separating element 3S, which in turn is fixedly attached to a properly aligned element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by matching the coding means of mixer and cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 81 of the mixer about the integral internal mixer parts comprising separate female inlets 83 and 84, the separating element 3S and the mixer element group 3. The mixer element group or part thereof could also be prealigned and be fixedly assembled within the mixer housing.

The mixer housing 81 is provided with longitudinal ribs 8, which end at the larger diameter 85. The larger end of the mixer housing has a nose piece 89, which provides a highly visible coded guide for alignment and insertion into the slotted prong 90 of the cartridge. The mixer housing 81 is also provided with a ring shaped bayonet socket attachment means 100 comprising two bayonet flange parts 94 and 95 acting as bayonet retaining means, having two cut outs 96 and 97 in between.

The cartridge 86 has two cylindrical containers 87 and 88 with the distanced outlets 14 and 15 for fitting and sealing within the mixer inlet section 82. The cartridge front 86A is provided with a slotted prong 90 and a guide piece 91 for preventing incorrect insertion of the mixer and further with two bayonet flanges 92 and 93 with tapered wedge shaped edges, corresponding in width with the mixer cutouts 96 and 97, and with reduced diameter cutouts 98 and 99 in between.

For attaching the mixer to the cartridge, the mixer inlet part 82 is introduced into the cartridge by aligning the nose piece 89 of the mixer housing within the slotted prong 90 while the part 91 acts as a guide piece as the mixer inlets are pushed onto and over the cartridge distanced male outlets 14 and 15 such that the cartridge flanges 92 and 93 correspond to and enter within the mixer cutouts 96 and 97. Upon rotating the mixer housing, the mixer bayonet flange parts 94 and 95 progressively move against the cartridge flanges 92 and 93, because of their tapered wedge shaped depth, forcing the mixer 80 against the cartridge front 86A. During this mixer to cartridge attachment, the mixer housing 81 rotates 90° about the stationary integral internal mixer parts.

The above bayonet arrangement, wherein the ring-shaped bayonet socket is at the accessory, as shown for a rotating mixer housing, can also be used in analogous manner for previously shown embodiments and for the closure caps, with the exception of the locking ring solutions. Alternative coding means arranged around the outer periphery of the mixer housing are possible or is achieved by different widths of cutouts and matching flange parts.

FIGS. 29–31 show a further embodiment wherein the mixer is provided with male inlet parts fitting into and sealing within the female cartridge outlets.

US 6,186,363 B1

9

FIG. 29 shows a mixer 101 comprising a mixer housing 102 with mixer outlet 4 and a mixer inlet section 103 containing two separate male inlets 104 and 105 followed by a separating element 3S which in turn is fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by matching the coding means of the mixer to the coding means of the cartridge, by pressing the mixer onto the cartridge and by rotating the mixer housing 102 about the integral internal mixer parts comprising separate male inlets 104 and 105, the separating element 3S and the mixer element group 3. The mixer element group or part thereof could also be prealigned and be fixedly assembled within the mixer housing.

The mixer housing 102 is provided with longitudinal ribs 8, which end at the larger diameter 106, the two lateral ends of which are formed as bayonet lugs 107 and 108, FIG. 30, cooperating with the bayonet retaining means of the cartridge. The bayonet lugs do not have the same width, lug 107 being larger.

The cartridge 109, FIG. 31, has two cylindrical containers 110 and 111 with the distanced female outlets 112 and 113 for fitting and sealing over the male mixer inlets 104 and 105. The cartridge front 114 is provided with the same bayonet means 16 as the cartridge of FIG. 4, comprising a ring shaped bayonet socket.

FIGS. 32–34 show a further embodiment wherein the mixer is provided with a male and a female inlet part fitting and sealing into/over the female/male cartridge outlets.

FIG. 32 shows a mixer 115 comprising a mixer housing 116 with outlet 4 and a mixer inlet section 117 containing a separate male inlet 118 and a separate female inlet 119 followed by separated chambers 117A and 117B, which in turn are fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 116 about the integral internal mixer parts comprising separate male inlets 118 and 119, the separated chambers 117A and 117B and the mixer element group 3. The mixer element group or part thereof could also be prealigned and be fixedly assembled within the mixer housing.

The mixer housing 116 is provided with longitudinal ribs 8, which end at the larger diameter 120, the two lateral ends of which are formed as bayonet lugs 121 and 122, FIG. 33, cooperating with the bayonet retaining means of the cartridge. The bayonet lugs do not have the same width, bayonet lug 121 being larger.

The cartridge 123 has two cylindrical containers 124 and 125 with one distanced male outlet 126 and one distanced female outlet 127 for, respectively, fitting and sealing within the separate female inlet 119 and over the separate male inlet 118 of the mixer. The cartridge front 128, FIG. 34, is provided with the same bayonet means 16 as the cartridge of FIG. 4, comprising a ring shaped bayonet socket.

The embodiments of FIGS. 35–43 show sector-shaped bayonet sockets instead of complete ring-shaped ones. The function and the attaching of the accessory are the same as in the previous embodiments, so that the three different embodiments of the bayonet means are illustrated in one respective example of mixer and cartridge. It is obvious that the sector-shaped bayonet socket and similar means can be provided on all other embodiments also.

FIG. 35 shows a mixer-cartridge assembly with a mixer 130 comprising a mixer housing 131 with outlet 4 and a mixer inlet section 132 containing two separate male inlets

10

133 and 134 followed by separating chambers 133A and 134A which in turn are fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 131 about the integral internal mixer parts comprising separate male inlets 133 and 134, the separated chambers 133A and 134A and the mixer element group 3. The mixer element group or part thereof could also be prealigned and be fixedly assembled within the mixer housing.

The mixer housing 131 is provided with longitudinal ribs 8, which end at the larger diameter 135, the two lateral ends of which are formed as bayonet lugs 136 and 137, FIG. 37, cooperating with the sector-shaped bayonet sockets 145, 146, serving as bayonet retaining means of the cartridge. The bayonet lugs have the same width and are provided each with a rib 136A and 137A at it's end which both strengthen each lug and acts as a stop as well as ensuring that the mixer can be turned and attached in one direction only. The upper surface of the lugs may have inclined surface parts so as to enforce the locking ability by an axial load. Corresponding inclined surface parts may also be located on the corresponding surface of the cartridge sector shaped bayonet sockets.

The cartridge 138 has two cylindrical containers 139 and 140 with two distanced female outlets 141 and 142 for receiving and sealing over the separate male inlets 133 and 134. The cartridge front 143, FIG. 36, is provided with bayonet means comprising sector-shaped bayonet sockets 145, 146 which act as prongs and are closed on one side by a rib 145A and 146A which connects to the cartridge end wall so as to stiffen and increase the strength of the bayonet prong. The cutouts 149 and 150 between the sector shaped bayonet sockets allow for the introduction of the mixer bayonet lugs 136 and 137.

In this embodiment the bayonet lugs and the sector shaped bayonet sockets have approximately the same width. The coding is achieved by other coding means on the mixer and on the cartridge. The cartridge front 143 is provided with a T-shaped protrusion 151 arranged between the two outlets and the mixer inlet face is provided with a similar protrusion 152 arranged off center between the mixer inlets, see FIGS. 36 and 37.

The two T-shaped coding means allow the attachment of the mixer in one orientation only since, when putting the mixer onto the cartridge such that when the two protrusions are laying one upon the other, they will prevent the introduction of the mixer inlets into the cartridge outlets and also any contact between the cartridge outlets and the mixer inlets or plugs of closure means thus preventing cross contamination and prohibiting mixer/accessory attachment. It is obvious that the coding protrusions can have any shape other than a T-form, and could be e.g., in the form of a keyway allowing only one defined position in which to introduce the mixer having a corresponding protrusion, or two differently shaped keyways and corresponding protrusions.

The coded alignment can be facilitated by visual coding means, e.g., a marking 153 at the cartridge outlet end and a marking 154 at the bayonet lug 137 of the mixer on the same side as the coding protrusion.

In the embodiment of FIGS. 38–40, the coding is achieved by cutouts of different widths between the lugs. FIG. 38 shows a mixer-cartridge assembly with a mixer 155 with a mixer housing 156, outlet 4 and integral internal mixer parts comprising two separate inlets 157 and 158

US 6,186,363 B1

11

ending into a disc-shaped flange and followed by separated chambers 157A and 158A which in turn are fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 156 about the integral internal mixer parts. The mixer element group 3 or part thereof, may also be prealigned and fixedly assembled within the mixer housing.

The mixer housing 156 is provided with longitudinal ribs 8, which end at the larger diameter 159, the two lateral ends of which are formed as bayonet lugs 160 and 161, FIG. 40, cooperating with the sector shaped bayonet retaining means of the cartridge. In this FIG. 38 and also in FIGS. 13, 32, 35 and 45 it is shown that the inlet end of the mixer housing has not only one cylindrical enlargement but two, e.g., one 159 at the inlet, lodging and sealing against the separate inlets 157, 158, followed by the second part 159A having an intermediate diameter and lodging and sealing against the separating means 157A, 158A. The bayonet lugs have the same widths but the gaps or cutouts 194, 195 between them are different, corresponding to the different widths of the sector shaped bayonet sockets on the cartridge.

These bayonet lugs 160, 161, can be provided each with a rib 167, FIG. 40, on the reverse side of the mixer inlet which both strengthen the lug and act as stop as well as limiting rotation in one direction only so as to prevent the mixer from being attached at 180° to the correct alignment. The upper surface of the lugs may have inclined parts, not shown, so as to enforce the locking and sealing ability by an axial force. Corresponding inclined parts, not shown, may also be located on the corresponding surface of the cartridge sector shaped bayonet sockets.

The cartridge 162 has two cylindrical containers 163 and 164 with two distanced female outlets 165 and 166 for receiving and sealing over the separate male inlets 157 and 158. The cartridge front 168, FIG. 39, is provided with bayonet means, comprising two sector-shaped bayonet sockets.

In FIG. 39, the bayonet means at the cartridge comprises two diametrically opposed sector-shaped bayonet sockets 169 and 170 acting as bayonet prongs for the bayonet lugs of the mixer, the two sockets having different widths, socket 169 having the greater width. The two cut outs 171 and 172 between the sockets allow for the introduction of the corresponding mixer bayonet lugs 160 and 161 into the sector shaped bayonet sockets 169, 170. As shown in this Figure, the passages of the bayonet sockets 169 and 170 commence as straight passages but become curved front the mid point onwards so as to achieve a greater strength against bayonet lug axial forces.

The passages can be wholly curved, without straight parts, and wholly or partly curved passages can also be provided on the ring-shaped bayonet attachment means.

In order to prevent any inadvertent contact whatsoever of the mixer or accessory inlet or inlets with the cartridge outlet or outlets by any form of tilting or tipping of one against the other during incorrect alignment the larger cut out 195 at the mixer is provided with a V-shape nose 192 corresponding to a V-shape incision 193 at the larger socket 169 such that the mixer is kept outside of the narrower bayonet socket 170 by the V-shape nose 192.

In this embodiment also the coded alignment can be facilitated by visual coding means, e.g., marking 153 at the cartridge and marking 154 at the corresponding lug.

In case no univocal attachment of a mixer to the cartridge 162 is necessary the cut outs between the lugs of the mixer

12

must be large enough to fit over the larger retaining means of the cartridge, whereas the visual coding means rest the same as previously described.

FIGS. 41–44 show a similar arrangement to that of the FIGS. 38–40 except that the mixer 200 is separate from coupling ring 196, the latter being rotated about the stationary mixer during the final rotary locking attachment of the coupling ring bayonet lugs 160A, 161A, into the sector shaped bayonet sockets 169, 170 of the cartridge 162.

FIG. 41 shows mixer 200 with the outlet 4 and comprising a housing 201 containing the mixer element group 3 in alignment with inlet part 197, the latter only partially contained within the mixer housing and comprising separate male inlets 157B, 158B and separate chambers 157C, 158C. A ridge 198 lodges and seals the inlet part 197 within the mixer housing. The coupling ring 196 is preassembled and prealigned with the mixer inlet part 197 via a groove 199, FIG. 41, in the coupling ring 196. FIG. 43 shows coupling ring 196 with the same coded bayonet lugs 160A, 161A, cut outs 194A, 195A, visual coding 154 and V-shape nose coding 192A as used in the embodiment according to FIG. 40.

FIG. 44 shows the mixer 200 and the cartridge 162 when assembled together. Prior to such assembly, the coupling ring 196 may be pre-assembled to the mixer under sufficient tension such that both components are held together in the correct relative alignment for initial visual coded and initial axial mechanical coded contact and attachment of the mixer inlets 157B, 158B to the cartridge outlets 165, 166 on the cartridge prior to the final rotary locking attachment of the coupling ring as described above. In this embodiment therefore, there is no rotation of the mixer housing 201 about the mixer inlet part 197 and element group 3 during attachment.

In the embodiment according to FIGS. 45–47 the sector-shaped bayonet sockets are at the mixer and the bayonet lugs at the cartridge, in analogy to the embodiment according to FIGS. 26–28.

FIG. 44 shows a mixer-cartridge assembly with a mixer 173 comprising a mixer housing 174 with outlet 4 and a mixer inlet section 175 containing the integral internal parts comprising two separate male inlets 176 and 177 followed by separated chambers 176A and 177A which in turn are fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 174 about the separate male inlets 176 and 177, the separated chambers 176A and 177A and the mixer element group 3. The mixer element group or part thereof could also be pre-aligned and be fixedly assembled within the mixer housing.

The mixer housing 174 is provided with longitudinal ribs 8, which end at the larger diameter 178, the two lateral ends of which are formed as two diametrically opposed sector-shaped bayonet sockets 179 and 180 (see FIG. 43) acting as prongs which are both closed at one side by a rib 179A and 180A connecting to the mixer wall so as to stiffen and increase the strength of the bayonet prong. The cut-outs 181 and 182, between the sockets, allow for the introduction of the cartridge bayonet lugs cooperating with the bayonet retaining means of the mixer.

The cartridge 183 has two cylindrical containers 184 and 185 with two distanced female outlets 186 and 187 for fitting and sealing over the separate male inlets 176 and 177. The cartridge front 188, FIG. 42, is provided with bayonet means, comprising sector-shaped bayonet lugs 190 and 191



US 6,186,363 B1

13

having the same width and each being provided with a rib 190A and 191A at its end which strengthens the lug and act as a stop as well as limiting rotation in one direction only so as to prevent the mixer from being attached at 180° to the correct alignment. The upper surface of the lugs may have inclined surface parts, not shown, so as to enforce the locking ability by an axial load. Corresponding inclined surface parts, not shown, may also be located on the corresponding surface of the mixer sector shaped bayonet sockets.

The lugs and the cutouts have approximately the same width. Thus, the required coding is achieved by other coding means on the mixer and on the cartridge. Therefore the cartridge front 188 is provided with the T-shaped protrusion 151 arranged between the two distanced female outlets and the mixer inlet race is provided with a similar shaped protrusion 152 arranged off center between the mixer inlets. See FIGS. 46 and 47.

The two T-shaped coding means allow the introduction of the mixer in one position only, since the placing of the mixer onto the cartridge is such that, when the two protrusions are laying one upon the other, they will prevent the introduction of the mixer separate male inlets into the cartridge distanced female outlets as well as any contact between the cartridge outlets and the mixer inlets, thus prohibiting cross contamination and mixer/accessory attachment. It is obvious that the coding protrusions can have any shape other than a T-form.

There are situations where the T-shaped coding protrusion give not a 100% protection to warrant no cross-contamination. FIGS. 48–58 show several coding protrusions, which are believed to warrant that no cross-contamination can occur even if the mixer is introduced onto the cartridge in the wrong sense. To this end the coding protrusions are arranged thus that no tilting around the axis connecting the centers of the two outlets of the cartridge, which could cause this contamination.

The cartridge 210 of FIG. 48 is similar to the cartridge 162 of FIG. 39 and has the same two cylindrical containers with two distanced female outlets 165 and 166 for receiving and sealing over the separate male inlets 157 and 158. The cartridge front diametrically opposed sector-shaped bayonet sockets 169 and 170 acting as bayonet prongs for the bayonet lugs of the mixer, the two sockets having different widths, socket 169 having the greater width. The two cutouts 171 and 172 between the sockets allow for the introduction of the corresponding mixer bayonet lugs 160 and 161 into the sector shaped bayonet sockets 169, 170. As shown in this Figure, the passages of the bayonet sockets 169 and 170 commence as straight passages but become curved from the mid point onwards so as to achieve a greater strength against bayonet lug axial forces.

In addition to the cartridge of FIG. 39, the front of this cartridge 210 is provided with a coding protrusions 212, consisting of two pins 213 arranged symmetrically to the axis connecting the centers of the outlets but asymmetrically as regards the transversal middle axis, e.g., on the side of one outlet.

FIG. 49 shows a mixer 214 similar to the mixer 155 of FIG. 38 with a mixer housing 156, outlet 4 and integral internal mixer parts comprising two separate inlets 157 and 158 followed by separated chambers 157A and 158A, which in turn are fixedly attached to a properly aligned first dividing element 3D of the mixer element group 3. Also this mixer is attached to the cartridge by pressing the mixer onto the cartridge and by rotating the mixer housing 156 about the integral internal mixer parts. The mixer element group 3 or

14

part thereof, may also be prealigned and fixedly assembled within the mixer housing.

The mixer housing 156 is provided with longitudinal ribs 8, which end at the larger diameter 159, the two lateral ends of which are formed as bayonet lugs 160 and 161 cooperating with the sector shaped bayonet retaining means of the cartridge. This mixer can also have two enlargement, e.g., one 159 at the inlet, lodging and sealing against the separate inlets 157, 158, followed by the second part 159A having an intermediate diameter and lodging and sealing against the separating means 157A, 158A. The bayonet lugs have the same widths but the gaps or cut outs 194, 195 between them are different, corresponding to the different widths of the sector shaped bayonet sockets on the cartridge, and have also ribs.

In addition to the mixer of FIG. 38 the inlet part of this mixer 214 is provided with the same coding protrusions 215 as those of the cartridge, consisting of two pins 216 and arranged in accordance to the pins 213 of the cartridge such that the mixer can only be introduced the correct way with regard to the other coding means without the possibility of tilting if introduced by force the wrong way.

The FIGS. 51–58 show further arrangement and forms of coding protrusions 212, whereby the cartridge as well as the mixer are always the same as in FIGS. 48–50 and only the coding protrusions are provided with numerals, the other parts being the same.

FIGS. 51 and 52 show a coding protrusions 212 on the cartridge front consisting of two bars 217 arranged symmetrically to the transversal middle axis of the cartridge but asymmetrically to the axis connecting the centers of the outlets. The two bars 218 of the mixer inlet part are arranged in accordance to those of the cartridge such that introduction and attachment of the mixer onto the cartridge is only possible in one position.

FIGS. 53 and 54 show a coding protrusions 212 on the cartridge front consisting of two D-shaped protrusion 219 arranged symmetrically to the transversal middle axis of the cartridge but asymmetrically to the axis connecting the centers of the outlets, with both flat sides looking in one direction. The two D-shaped protrusions 220 of the mixer inlet part are arranged in accordance to those of the cartridge such that introduction and attachment of the mixer onto the cartridge is only possible in one position.

FIGS. 55 and 56 show a coding protrusions 212 on the cartridge front consisting of a male plug 221 and a female plug 222 arranged symmetrically. The male plug 223 and the female plug 224 of the mixer inlet part are arranged in accordance to those of the cartridge such that introduction and attachment of the mixer onto the cartridge is only possible in one position.

FIGS. 57 and 58 show a particularly effective coding protrusions 212 on the cartridge front consisting of a bar 225 on one side of the axis connecting the centers of the outlets and two spaced bars 226 on the other side of this axis, arranged symmetrically to the transversal middle axis of the cartridge. The single bar 227 and the double bar 228 of the mixer inlet part are arranged in accordance to those of the cartridge such that introduction and attachment of the mixer onto the cartridge is only possible in one position.

All these coding protrusions prevent efficiently tilting of the mixer during attachment to the cartridge and hence cross-contamination.

The coded alignment can be facilitated by visual coding means, e.g., the marking 153 at the cartridge, opposite the protrusion and the marking 154 at the lug of the mixer near the coding protrusion.

US 6,186,363 B1

15

It follows from the embodiment according to FIGS. 32–34 that the mixer inlets and the cartridge outlets may be either female or male respectively and it follows also that it is possible to provide the mixer with one female and one male inlet fitting over/into the corresponding male/female outlet of the cartridge.

This latter arrangement provides for a further coding means since only one position is possible for matching the mixer or closure means to the cartridge. This mixed arrangement of coding and coding means is independent from the manner of attachment with a coupling ring, locking ring or rotatable mixer housing.

While the different widths of the bayonet lugs provide for a distinct coding means, it might be advantageous to enhance this effect by visualisation of the coding by optical means such as different colors, a notch and a marking or by providing one lug of the accessory with a cut-out and the corresponding nose at the cartridge bayonet means. This can be done either for visual marking one of the coding parts or for the coding itself.

Cartridges separated with one single wall, e.g., according to U.S. Pat. No. 5,333,760, cannot exclude chemical migration through such a single wall separation barrier and therefore separation at the cartridge outlets is not sufficient to prevent migration and therefore a reaction within the cylinders during storage.

It follows in particular from the FIGS. 5, 14, 26, 29, 32, 35, 38 and 41 that it is advantageous to provide for a single piece cartridge consisting of two complete, preferably cylindrical containers which are substantially separated by an air gap L in between, see e.g. FIG. 32. This assures a total chemical separation along the whole length where the chemicals are contained, ahead of the cylinder pistons, all the way to the top of the outlets where, during storage, a closure means is installed. During dispensing, this separation is further maintained within the mixer up to the first dividing element 3D of the mixer element group.

The invention however, is not limited to air gap separated containers and applies as well to cartridges with containers separated by one single wall according to FIG. 3.

It follows from the above description that the inventive cartridge to accessory attachment combination provides in particular for cartridge containers separated by an air gap up to and including the individual outlets and for a port to port coded alignment for same or dissimilar size ports, with no cross-contamination caused by rotation or random attachment, while maintaining separation past the interface and well into the mixer, so as to hinder the spreading of any possible reaction and plugging of the components at the interface and back into the cartridge outlets. This combination also provides optimization of the mixing performance especially, but not uniquely, for ratios other than 1:1.

While the foregoing description and the drawing of the cartridge embodiments pertained to multiple component cartridges with side-by-side containers the teaching of the present invention is not limited thereto and can be applied as well to cartridges with concentric containers or otherwise arranged and formed containers.

However, the principle of coded attachment ensures both the correctly aligned connection of a mixer or accessory to cartridge outlets since only one position of the mixer or accessory is possible and, in the case of the re-connection of mixer or closure cap to a cartridge, eliminates the possibility of cross-contamination.

Furthermore, and in respect to mixers, all the above described embodiments have the advantage of comprising

16

the minimum number of parts and of being compact, resulting in low molding and assembly costs since the whole inlet section comprising the separating means and the mixer element group is made in one piece. Also the integral construction of this internal part ensures proper alignment thus providing optimum mixing efficiency.

In the case of the first embodiment according to FIG. 1 when a relatively long mixer element group is used and where rotational friction between this mixer element group and the mixer housing might cause problems, it may be preferable to separate a part or the whole of the mixer element group from the separating means of the inlet section such that a part or the whole of the mixer element group may be fixedly assembled within the housing and therefore it rotates with the housing while connecting the mixer to the cartridge.

In this case—and as seen from the mixer inlet to the mixer outlet—the leading edge of the first element of the mixer element group, or of a portion thereof, must be fixedly assembled within the housing in a pre-aligned position. Therefore, after rotating the housing so as to attach the mixer to the cartridge, correct alignment of the elements is achieved such that each of the two material streams leaving the separating means, or the first element group attached to the separating means, will be evenly divided by the leading edge of the first element of the element group, or portion thereof attached to the housing, for optimum mixing efficiency.

It is evident that instead of cylindrical inlets and outlets, D-shaped or differently shaped similar or dissimilar sized inlets and outlets are possible (see FIGS. 8a and 9a). In certain embodiments, the respective inlets of the mixer housing or the outlets of the cartridge have different sizes or shapes providing the coded alignment between the cartridge and the mixer. Furthermore, the same principle can also be used for a dispensing device, or cartridge, for more than two components.

We claim:

1. A mixer for a cartridge, the cartridge having a plurality of chambers each having an outlet, the mixer comprising:
  - a housing;
  - a mixer element disposed in said housing;
  - a plurality of inlets for engagement with the outlets of the cartridge and mounted on said housing;
  - a bayonet coupling on said housing for detachably connecting said mixer to the multichamber cartridge, said bayonet coupling having locked and unlocked positions;
  - a coding element that permits said inlets of said housing to be aligned and connected to the outlets of the cartridge in only one orientation; and
  - said coding element comprising each of said inlets being of different configuration from the other.
2. A mixer according to claim 1, wherein said coding element comprises said inlets being of different shape from each other.
3. A mixer according to claim 1, wherein said coding element comprises said inlets being of different size from each other.
4. A dispensing device, comprising:
  - a cartridge,
  - a mixer, and
  - complementary coding elements formed on said cartridge and mixer,
 said cartridge comprising:

## US 6,186,363 B1

17

a plurality of chambers each having an outlet, and  
 a first bayonet coupling;  
 said mixer comprising:  
 a housing with a plurality of inlets corresponding in  
 number to said outlets, each inlet being configured to  
 engage a respective one of said outlets,  
 a mixer element disposed in said housing, and  
 a second bayonet coupling complementary with said  
 first bayonet coupling of said cartridge, said first  
 bayonet coupling being detachable from said second  
 bayonet coupling and together forming a detachable  
 bayonet assembly; and  
 wherein said coding elements permit said inlets of said  
 mixer to be aligned and connected to the respective  
 outlets of said cartridge in only one orientation and  
 wherein said coding elements comprise said outlets  
 being of different size relative to each other and said  
 respective inlets being configured to conform thereto.

18

5. A cartridge for a mixer, the mixer having a plurality of  
 inlets, the cartridge comprising:  
 a plurality of chambers each having an outlet for engage-  
 ment with the inlets of the mixer; and  
 a bayonet coupling on said cartridge for detachably con-  
 necting said cartridge to the mixer;  
 each said outlet of said chambers being of a different  
 configuration from each other said outlet to permit each  
 said outlet to be aligned and connected to the respective  
 inlets of the mixer in only one orientation.  
 6. A cartridge according to claim 5, wherein each said  
 outlet of said chambers is of a different size from each other  
 said outlet.  
 7. A cartridge according to claim 5, wherein each said  
 outlet of said chambers is of a different shape from each  
 other said outlet.

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